

# DOCUMENT RESUME

ED 054 331

VT 012 725

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TITLE Employment Characteristics of The Pennsylvania State University Associate Degree Graduates.  
INSTITUTION Pennsylvania State Univ., University Park. Dept. of Vocational Education.  
SPONS AGENCY Pennsylvania State Dept. of Education, Harrisburg.  
PUB DATE Jan 71  
NOTE 93p.  
EDRS PRICE EDRS Price MF-\$0.65 HC-\$3.29  
DESCRIPTORS \*Associate Degrees, College Graduates, \*Drafting, \*Electronics, \*Employment Patterns, Graduate Surveys, \*Occupational Mobility, Questionnaires

## ABSTRACT

As part of an overall study concerned with determining the relationships between the associate degree electronics engineering technology and drafting design technology graduates and various factors, this following study of Pennsylvania graduates considers employment experience and place of residence. A stratified random sample of 33 percent of the 6,200 graduates from the years 1955-1969 was surveyed on both first and present jobs to show job trends and mobility. A residential distribution of graduates is included in addition to the job patterns. Abundant tables and graphs provide the data. Related documents are available as VT 013 460 and VT 013 461. (BH)

VOCATIONAL  
EDUCATION  
DEPARTMENT  
OF THE  
PENNSYLVANIA  
STATE  
UNIVERSITY

EMPLOYMENT CHARACTERISTICS OF  
THE PENNSYLVANIA STATE UNIVERSITY  
ASSOCIATE DEGREE GRADUATES

Angelo C. Gillie

January 1971



VOCATIONAL - INDUSTRIAL EDUCATION **Research Report**

ED054331

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The research reported herein was partially supported by The Center for the Study of Higher Education (P.S.U.), The Department of General Engineering (College of Engineering), and the Bureau of Vocational, Technical, and Continuing Education (State Department of Education, Commonwealth of Pennsylvania).

Department of Vocational Education  
The Pennsylvania State University  
University Park, Pennsylvania

January 1971

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### ACKNOWLEDGEMENTS

Several persons have made meaningful contributions to the findings reported herein. Initial encouragement and advice was provided by Dr. Joseph T. Impellitteri, Chairman of Graduate Studies and Research of the Department of Vocational Education. Mr. Ernest R. Weidhaas, Assistant Dean of Commonwealth Campuses, provided assistance in establishing communications with key faculty and administrators in the various campuses of the university. Special thanks are also given to Mr. Jerome T. Kapes for his invaluable assistance relating to treatment of the data, and to Miss Roxanne Miller for the time spent in compiling the data into the categories needed for this report. The author also wishes to express his appreciation to the various faculty and administrators who were so helpful with suggestions during the questionnaire design and pretesting phase.

The major financial support for this study was derived from the Department of Vocational Education. It should be mentioned that significant financial assistance was given by The Center for the Study of Higher Education of the University, and The Department of General Engineering. This effort was also supported by the Bureau of Vocational, Technical and Continuing Education, Pennsylvania Department of Education.

The author is especially appreciative for the sustained efforts of Mr. Richard R. Olson and Mr. Edward D. Cory, who by and large were responsible for the collection of the data. Any errors which may appear in this report are those of the author.

### ABSTRACT

The study is based on a total population of about 6,200 graduates of electronics and drafting design curriculums from each of the years 1955-1969. Thirty-three percent of this population was selected in a stratified random manner. Fifty-three percent of our sample responded after a series of three follow-up letters. Eleven percent of the questionnaires were returned by the Post Office as being undeliverable. A ten percent random sample was taken from the remaining non-respondents for the purpose of comparing them with the original respondents. They were contacted by telephone, which resulted in an eighty-seven percent response from this group.

The pooled variance t-test was used to compare these two groups on 59 variables and it was found that the respondent group was not significantly different from the non-respondents. On that basis, inferences drawn from the respondents may be generalized to the entire sample.

The factors considered in this portion of the study deal with the employment of the graduates and where they live. Data relative to their first jobs and present jobs was obtained from the questionnaire, as was their present home address. This data was used to identify employment trends for first post graduation jobs and the jobs they had at the time the survey was made (winter 1969-70). A number of discernible trends were found and are reported in this publication. It was found that a number of the graduates have had only one post graduation position, and the trends for these are analyzed here also. The information arrived at relative to present and first jobs was then examined in terms of "job trend lines," which display the change in the number of graduates hired by the top twenty

employers for first jobs and present jobs. The amount of "people flow" into and out of jobs for the top twenty employers was examined. Several ratios and the Employee-Employer Job Mobility Factor were developed and incorporated into the analysis.

The residential distribution of the graduates is also reported. Those reporting home addresses in the Commonwealth of Pennsylvania were examined first and the distribution of their residences on a county basis has been compiled. The graduates having out-of-state residences were then examined with regard to the distribution of their home addresses on a state by state basis.

Since the purpose of this report is to present a considerable amount of information obtained from analyzing a very large amount of data in descriptive form, heavy reliance has been placed on the use of tables and graphical displays.

### STATEMENT OF THE PROBLEM

The overall investigation, of which this is one of several parts, is an outcome of a concern for ascertaining the relationships that exist between the associate degree electronics engineering technology and drafting design technology graduates and a number of factors. Graduation groups from each of the years from 1955 through 1969 have been included. Our two major reasons for searching for answers to the above are:

1. To provide a feedback of information to the faculty and administration that might be translatable into a modification of the curriculum.
2. To contribute to the literature dealing with the employment and in-state--out-of-state residence patterns of technicians.

Faculty and administrators of technician programs have long been concerned about what happens to the graduates. These concerns were expressed by those faculty and administrators in the commonwealth campuses of The Pennsylvania State University that were contacted by this investigator during the process of ascertaining what specific information should be sought. These suggestions became the basis for building the questionnaire. (See Appendix IV.)

The purpose of this portion of the follow-up study of The Pennsylvania State University Associate Degree graduates from 1955 to 1969 is to report findings relating to certain employment characteristics. First to be considered are trends in employment, which are in terms of: a) first jobs; b) present jobs; c) only jobs; d) comparison of first and present jobs. Several flow relationships between the employers and graduates were examined, and findings are reported here in terms of: Total Flow Toward



Employer, Employee-Employer Job Mobility Ratio, Employer Later Job Propensity, Employer First Job Propensity, and Retention Factor.

Because of the length of time since associate degree technicians have been graduated from the University, the employment and residence information for a representative sample of both the Electronics Engineering Technology and Drafting Design Technology programs from all of the commonwealth campuses was not available. Therefore, this information was obtained and analyzed. It was felt that having this kind of data might be of value to the faculty and administrators of the commonwealth campuses.

This report provides a feedback of some aspects of the work lives of the graduates as indicated above. The hope is that the information will be of use to faculty, administrators, and others associated with curriculum planning in the commonwealth campuses.

### THE SAMPLE AND SAMPLING STRATEGY

The population consisted of the associate degree graduates of the electrical-electronics technology (EET) and drafting design technology (DDT) programs of the commonwealth campuses of The Pennsylvania State University for the graduation years of 1955 through 1969 (inclusive). The entire population consisted of about 6,200 associate degree graduates. A ten step stratified random sampling procedure (I:87-88) was used to obtain the sample from this entire population (the sampling strategy is illustrated in the flow diagram of Appendix VI). A random sample of thirty-three percent of the entire population was selected as our sample.

A follow-up letter was sent approximately every two weeks, for a total of three tries. Eleven percent of the questionnaires were returned by the postal authorities as undeliverable. (See Appendix V.) After a period of around six weeks from the time the questionnaire was first sent out, the second phase of our strategy was put into effect. The non-respondent group (excluding those returned by the Post Office Department) represented about 36% of the original sample and was given special treatment. A ten percent stratified random sample from this group was taken.\* They were contacted either at home or at their place of employment by telephone. The approach was successful, as almost nine-tenths of the special telephone sample (87%) completed and returned their questionnaires. (See Appendix V.) This provided us with some basis for statistically

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\*This actually became 12.7% because of rounding within each stratum.

comparing the original respondents with the non-respondents (the assumption being made that the telephone respondents are typical of the non-respondent group since they were also selected in a random fashion).

Results: The original sample size was 2,098 associate degree graduates (1,100 DDT and 998 EET graduates). The sampling results were as follows:

1. About 230 questionnaires (11% of the entire sample) were returned by the postal authorities because the graduate had moved and no forwarding address was available;
2. About 1,100 (53% of the total) were completed and returned by the regular mailing and three follow-up letter strategy;
3. Ninety-seven graduates were selected for the telephone group (which represented 4.8% of the total sample). Eighty-four of them filled out and returned the questionnaire (a response rate of 87%).

Note: A brief explanation as to why it was felt that obtaining a high response rate from the telephone group was essential is in order. Since the persons in the telephone group were selected on a random basis, it could be assumed they would be representative of the non-respondent group. Comparing the questionnaire returns of this group with those of the original respondents would be an acceptable basis for examining these two groups (i.e. the original respondents and the telephone group) for similarities and differences.

Comparing the Original and the Telephone Follow-up Groups: The questionnaire received from individuals in the two groups (regular respondents and the telephone group) were compared in order to identify any significant differences in their responses. We elected to use a t-statistic for this analysis because:

1. The population from which the sample was taken is normally distributed;

2. The sample is representative of the population being studied, since a stratified random sampling strategy was utilized.

We then had to select the t-statistic that was most appropriate for our purpose. In comparing the size of the original group of respondents to that of the telephone follow-up group, we found that the ratio is about 13/1. From this we assumed the variances of corresponding items for the two groups were not similar.

In order to carry out the analysis, a pooled t-test (2:197-198) was used. One of the required assumptions of this test is that the variances of the two groups are equal. A casual inspection of the variances showed that they appeared to be approximately equal. It was assumed that the variances of the original group of respondents and the follow-up group were equal. If they were not equal (i.e., if the assumption is false) the result may be either an increase or a decrease in alpha. If the variances are equal the actual value of alpha ( $\alpha$ ) is equal to the value selected (i.e.,  $\alpha = .05$ ). If the variances are not equal the result is to increase or decrease alpha and therefore increase or decrease the probability of a type one error (in this case the chance of finding a difference between groups is either greater or less than alpha, i.e.,  $\alpha < .05$ ).

These two groups were tested for the following items:

1. First job salary
2. Number of miles between first job and hometown high school
3. Present job salary
4. Number of miles between present job and hometown high school
5. Number of times there has been a simultaneous job and residence change
6. Number of times there has been a simultaneous job change and change in company or business firm
7. The respondent's evaluation of the course work  
(There was a total of 48 items in this category.)

A total of 59 t-tests were conducted for each of the three graduation groups in each curriculum, these six groups were:

EET	1955-59	1960-64	1965-69
DDT	1955-59	1960-64	1965-69

Having used about 60 t-tests for each of the groups, we would expect up to three items to be significantly different for a confidence level of .05 ( $\alpha = .05$ ). Only the 1965-69 DDT (with six items) and 1955-59 EET (with four items) groups fell outside these limits, and then only barely so. The conclusions drawn from conducting the t-tests is that the original respondents and the non-respondents were found to be the same in terms of responses to the questionnaire items. Having established this fact, we are now able to say that the characteristics found for the respondents are also applicable for the entire technician population of the study.

### TRENDS IN EMPLOYMENT

In this section, four aspects of employment trends are reviewed and analyzed, they are: first jobs, present jobs, only jobs, and a comparison of first and present jobs. Particular attention is given to the top twenty to thirty employers within each of the three basic categories. It was found that the larger employers provided most of the jobs (50 percent of the first jobs, 42 percent of the present jobs, and 62 percent of the only jobs). The remaining jobs in each of the categories were widely dispersed among a much larger number of minor employers. There was not a complete overlap of major employers in each of the categories, as shown in the major employer tables for the three categories that appear in the following paragraphs. The final part of this section, which deals with an analysis of trends between first and present jobs, points out the degree of mutuality that exists between the major employers in these two categories.

First Jobs: The graduates, over the years 1955 through 1969 inclusive, accepted first jobs from a total of 320 employers (listed in Appendix I). Also, 60 graduates continued on to further education immediately after receiving their associate degrees, and 30 of the graduates went into a branch of the military service.

Table 1 lists the top 23 employers\* for first jobs. A total of 544 of the 1,097 graduates (49.48 percent) reporting their first jobs in this study accepted positions from these 23 employers. Bell Telephone placed at the top of the list with over seven percent (78) of the 1,097 graduates

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\*Twenty-three rather than twenty employers appear in the table because of the four-way tie for the twentieth position in the rank order sequence.

taking their first jobs with them. Second through fifth on the list were I.B.M. (5.37 percent), Eastman Kodak (3.19 percent), Xerox (3.00 percent), and DuPont (2.91 percent).

These top 23 employers provided first jobs for 49.48 percent of the graduates. The distribution of the first jobs among these top 23 employers is displayed in Figure 1.

The remaining 50.52 percent of the graduates accepted first jobs from the remaining 297 employers. Many of the lower ranked employers provided after graduation first jobs for only one of the graduates over the entire fifteen year span of this study. The result is that about half of the first jobs are sparsely distributed over almost 300 employers. The employee-employer ratio for these minor employers is:

$$REE_{mel} = \frac{NG_{mel}}{NE_{mel}}$$

where

$REE_{mel}$  = employee-employer ratio for first jobs with minor employers

$NG_{mel}$  = number of graduates with first jobs with minor employers = 553

$NE_{mel}$  = number of minor employers for first jobs = 297;

therefore,

$$REE_{mel} = \frac{553}{297} = 1.86 \text{ employees/employer}$$

Let us compare this with the ratio found for the top employers, which is:

$$REE_{tel} = \frac{NG_{tel}}{NE_{tel}}$$

where

tel = top employers for first jobs

substituting values from Table 1, and solving,

$$REE_{tel} = \frac{544}{23} = 23.68 \text{ employees/employer}$$

It is interesting to note that all of the top 23 first job employers are large business enterprises, and a considerable number of them are military-based type activities (such as DuPont, General Electric, McDonnell-Douglas, Sandia, Newport News Shipbuilding, Boeing, Rocketdyne, and RCA). Several public service employers also appear in this group. They are: Pennsylvania Power and Light, Pennsylvania Department of Highways, and Virginia Power and Light.



TABLE I

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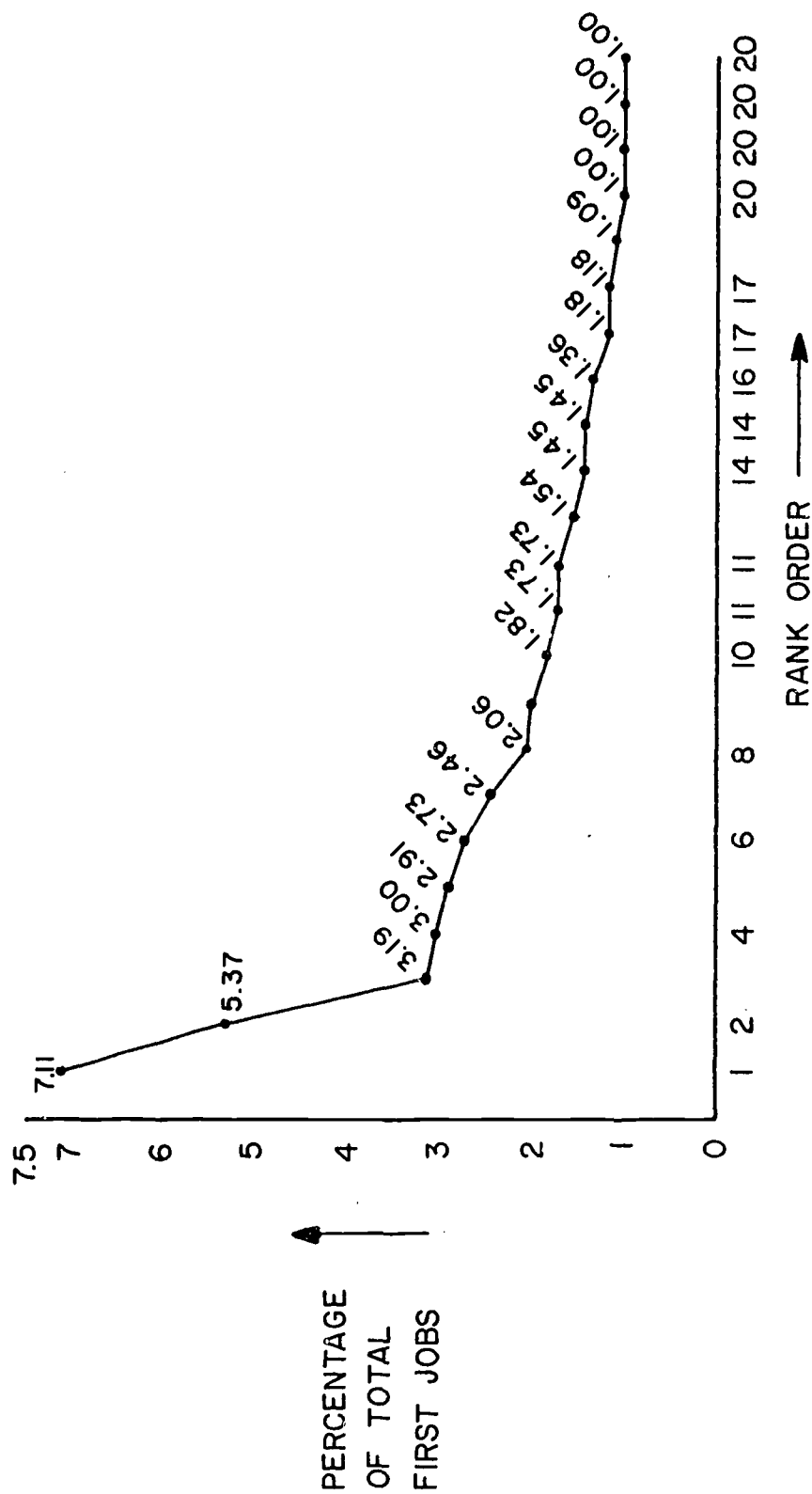
## FIRST JOB: TOP 20 EMPLOYERS\*

<u>Company Name</u>	<u>First Job # of Graduates</u>	<u>Rank Order</u>	<u>%**</u>
Bell Telephone	78	1	7.11
I.B.M.	59	2	5.37
Eastman Kodak	35	3	3.19
Xerox	33	4	3.00
DuPont	32	5	2.91
Pa. Dept. of Highways	30	6	2.73
General Electric	27	7	2.46
Western Electric	23	8	2.09
McDonnell-Douglas Corporation	23	8	2.09
Sandia Corporation	20	10	1.82
U. S. Steel	19	11	1.73
Newport News Ship Building	19	11	1.73
Pa. Power and Light	17	13	1.54
Babcock & Wilcox	16	14	1.45
Boeing	16	14	1.45
Westinghouse	15	16	1.36
Koppers Co., Inc.	13	17	1.18
Rocketdyne	13	17	1.18
Elliott Company	12	19	1.09
Virginia Power & Electric	11	20	1.00
Ingersoll-Rand Company	11	20	1.00
New Jersey Zinc Company	11	20	1.00
RCA	11	20	1.00
TOTAL	544		49.48%

\*Total number of respondents who listed their first job is N = 1097.

\*\*Percent of 1097.

16

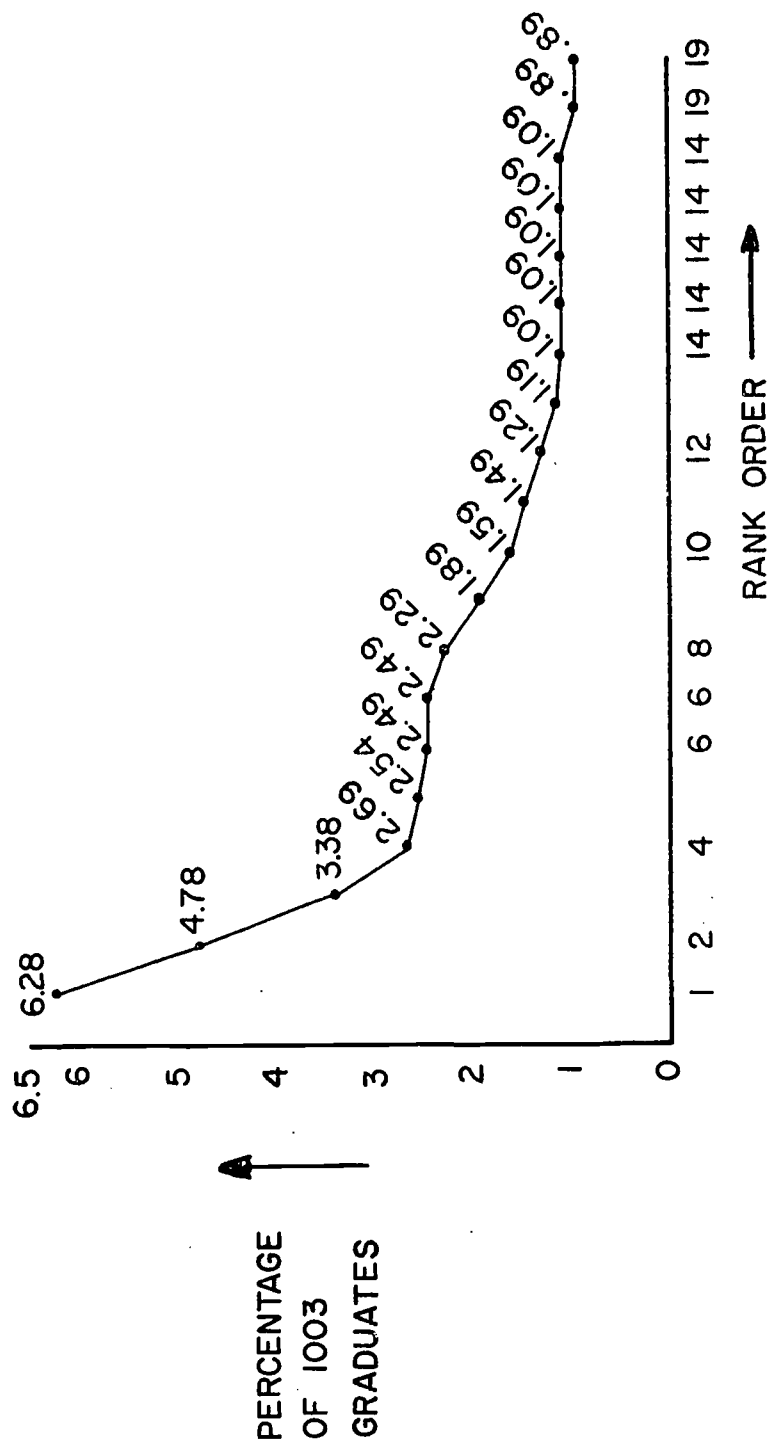


PERCENTAGE DISTRIBUTION OF FIRST  
JOBS FOR THE TOP 23 EMPLOYERS

FIGURE - I

Present Jobs: A total of 1,003 graduates reported present jobs that are distributed among 405 employers (see Appendix I). Just under 42 percent of the present jobs (419) are with 20 employers, which are listed in Table 2 as the top employers. Bell Telephone again leads, with 6.28 percent of the present jobs. Following Bell Telephone are six employers having more than two percent of the present jobs each. They are: IBM (4.78 percent); Pennsylvania Department of Highways (3.38 percent); General Electric (2.69 per cent); U.S. Steel (2.54 percent); Western Electric (2.49 percent); Xerox (2.49 percent); and Pennsylvania Power and Light (2.29 percent).

As was found with the first jobs, there is a prevalence of large corporations associated with military type products among the top twenty. A small increase in the number of public service type employers has been observed (Pennsylvania Department of Highways, Pennsylvania Power and Light, Pennsylvania State University, and Metropolitan Edison).



PERCENTAGE DISTRIBUTION OF PRESENT  
JOBS FOR THE TOP 23 EMPLOYERS.

FIGURE - 2

The remaining 58 percent (584) of the graduates hold present jobs with employers not listed with the upper twenty group, and they are referred to as the minor employers. These jobs are sparsely dispersed among a total of 385 minor employers. The employee-employer ratio for the minor employers is:

$$REE_{mep} = \frac{NG_{mep}}{NE_{mep}}$$

where

$REE_{mep}$  = employee-employer ratio for present jobs with minor employers

$NG_{mep}$  = number of graduates with present jobs with minor employers = 584

$NE_{mep}$  = number of minor employers for present jobs = 385,

therefore,

$$REE_{mep} = \frac{584}{385} = 1.52 \text{ employees/employer}$$

Let us compare the above with the ratio found for the top employers,

which is

$$REE_{tep} = \frac{NG_{tep}}{NE_{tep}}$$

where

tep = top employers for present jobs

Substituting values from Table 2 and solving,

$$REE_{tep} = \frac{419}{20} = 20.95 \text{ employees/employer}$$

It should be noted that 80 graduates listed themselves as full-time students at the present time and 63 are in the military service. They are not included among the 1,003 total reported above, which would bring the total to 1146 graduates. The student-military group represents about 12.5 percent of the grand total of 1,146 associate degree graduates.

TABLE 2

## PRESENT JOBS: TOP 20 EMPLOYERS\*

<u>Company Name</u>	<u>Present Job</u>	<u>Rank Order</u>	<u>%</u>
Bell Telephone	63	1	6.28
IBM	48	2	4.78
Pa. Dept. of Highways	34	3	3.38
General Electric	27	4	2.69
U. S. Steel	26	5	2.54
Western Electric Co.	25	6	2.49
Xerox	25	6	2.49
Pa. Power & Light	23	8	2.29
DuPont	19	9	1.89
Westinghouse Electric Co.	16	10	1.59
Newport News Shipbuilding	15	11	1.49
RCA	13	12	1.29
Eastman Kodak	12	13	1.19
Sandia Corporation	11	14	1.09
Pennsylvania State University	11	14	1.09
AMP, Inc.	11	14	1.09
Babcock and Wilcox	11	14	1.09
Metropolitan Edison	11	14	1.09
N.A. Rockwell Mfg.	9	19	0.89
McDonnell-Douglas Corp.	9	19	0.89
TOTAL	419**		41.62%***

\*Total number of respondents who listed their present jobs (N = 1,063).

\*\*Total number of respondents who listed their present jobs as among the top 20 employers.

\*\*\*Represents percent of total respondents reporting a "Present Job."

Only Jobs: Table 3 lists the top employers of graduates who have had only one job since earning their associate degree. Five hundred graduates reported they were at their first and only post graduation job. Just over 62 percent of this group (312) held only jobs with twenty-two employers. A word of caution relative to the interpretation of these figures is in order. The data presented here does not consider the length of time these graduates have been out of college. Therefore, many of them may in fact been at their present job for only a year or so.

The remaining 37.60 percent of the only job holders have positions with 121 minor employers. The employee-employer ratio for the minor group is:

$$REE_{meo} = \frac{NG_{meo}}{NE_{meo}}$$

where

$REE_{meo}$  = employee-employer ratio for only jobs with the minor employers

$NG_{meo}$  = number of graduates with only jobs with the minor employers = 188

$NE_{meo}$  = number of minor employees for only jobs - 121.

therefore,

$$REE_{meo} = \frac{188}{121} = 1.55 \text{ employees/employer}$$



Let us compare the above with the ratio found for the top employers,  
which is

$$REE_{teo} = \frac{NG_{teo}}{NE_{teo}}$$

where

teo = top employers for only jobs.

Substituting values from Table 3 and solving,

$$REE_{teo} = \frac{312}{22} = 14.19 \text{ employees/employer}$$

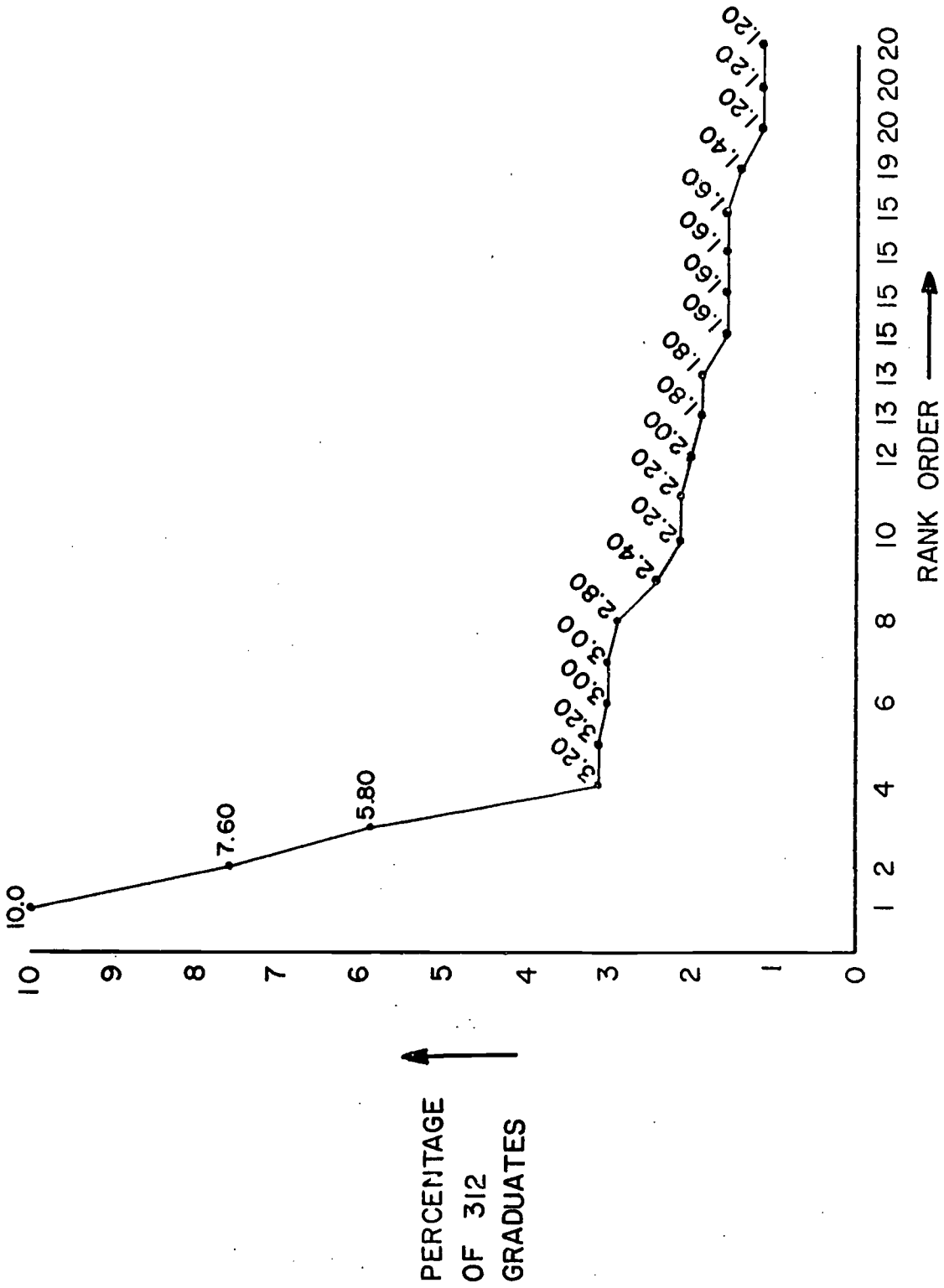
TABLE 3

ONLY JOB: TOP 22 EMPLOYERS\*

<u>Company Name</u>	<u>Only Job</u>	<u>Rank Order</u>	<u>%</u>
Bell Telephone	50	1	10.00
IBM	38	2	7.60
Pa. Dept. of Highways	29	3	5.80
Pa. Power & Light	16	4	3.20
Xerox	16	4	3.20
U. S. Steel	15	6	3.00
Newport News Shipbuilding	15	6	3.00
DuPont	14	8	2.80
General Electric	12	9	2.40
Babcock and Wilcox	11	10	2.20
Western Electric	11	10	2.20
Sandia Corp.	10	12	2.00
Eastman Kodak	9	13	1.80
Pennsylvania State Univ.	9	13	1.80
Koppers Co., Inc.	8	15	1.60
Metropolitan Edison	8	15	1.60
National Security Agency	8	15	1.60
Proctor & Gamble	8	15	1.60
NA Rockwell Mfg.	7	19	1.40
McDonnell-Douglas Corp.	6	20	1.20
Boeing	6	20	1.20
RCA	6	20	1.20
TOTALS	312**		62.40%

\*Total number of graduates that listed an "Only Job" in entire study (N=500).

\*\*Total number of graduates that listed an "Only Job" for the first 20 top ranked employers (62.40% of 500 = 312).



PERCENTAGE DISTRIBUTION OF ONLY  
JOBS FOR THE TOP 22 EMPLOYERS

FIGURE — 3

Comparison of First and Present Jobs: The first, only, and present job for the graduates are tabulated in Appendix I. It is seen that 1097 graduates had "first jobs" with 320 employers, 500 had "only jobs" with 143 employers, and 1003 had "present jobs" with 405 employers. Table 4 is a shortened version of Appendix I in that it lists only those employers who hired at least five graduates for their first post graduation job. This reduced the number of first job employers to 49. This ties in with the very low employee-employer ratio found in the preceeding paragraphs for minor employers in the three job categories ( $REE_{me1} = 1.86$ ;  $REE_{me0} = 1.55$ ;  $REE_{mep} = 1.52$ ).

Of particular interest is the trend from first job to present job. Those employers that appeared in the top twenty-three (in terms of graduates hired) for the first job category and those found to be among the top twenty in the present job classification were included in this trend analysis. Because of considerable commonality of employers found in these upper rankings in the two categories, only twenty-seven employers appear in the trend analysis. If there was a complete lack of commonality in this regard, the twenty-three top employers of first jobs would have been completely different from the top twenty employers of present jobs. Should this have occurred, our trend analysis would have had to deal with a total of 43 employers.

Figures 4 and 5 display the trend of employment from first job to present job. The vertical axis on the left displays the number of graduates hired by the leading employers for first jobs. The information provided includes: employer name, number of graduates hired for first jobs, and the rank order of each concern in terms of first job hiring (given in parentheses). The vertical axis on the right displays the same information for the

present job category. The line joining the two points for an employer, which is called the job trend line in this report, graphically displays the change in employment frequency. For example: In Figure 4, Xerox employed 33 graduates for their first jobs and had a rank order of four, but 25 graduates are presently employed by Xerox, and the rank order dropped to six.

The overall trend for a specific employer (increase, decrease, or no change between the number of graduates hired for first post graduation jobs and present jobs) can be readily determined by observing the slope of the trend line. Using this approach, a downward (from left to right) slope reflects a reduction from  $N_{\text{first job}}$  to  $N_{\text{present job}}$ , whereas an upward (from left to right) slope depicts the opposite type of change. Also, the magnitude of the slope indicates the size of the change. For example, consider the slopes for Bell Telephone and Xerox. The slopes are both downward, with the Xerox slope being less severe. Computing the changes for each, we find:

$$\text{Bell Telephone: } N_{\text{present job}} - N_{\text{first job}} = 63 - 78 = -15$$

and

$$\text{Xerox: } N_{\text{present job}} - N_{\text{first job}} = 25 - 33 = -8$$

Using the Job Trend Lines of Figures 4 and 5, it is seen that a number of employers experienced a significant decrease in the number of graduates presently employed as compared to the number hired for their first post graduation jobs. The greatest decreases were found in the

following: Bell Telephone (-15), DuPont (-13), Eastman Kodak (-13), Rocketdyne (-13), IBM (-11), Sandia (-9), Boeing (-9), Elliot (-8), and New Jersey Zinc Co. (-8).

The employers whose job trend shows a significant increase in graduates employed in present jobs over first jobs include: U.S. Steel (+7), Pennsylvania Power and Light (+6), and AMP, Inc. (+6).

The remainder of the 15 employers experienced no large changes between first and present job employment of the graduates.

COMPANY (RANK ORDER IN PARENTHESES)      FIRST JOB      PRESENT JOB      COMPANY (RANK ORDER IN PARENTHESES)

NUMBER EMPLOYED

NUMBER EMPLOYED

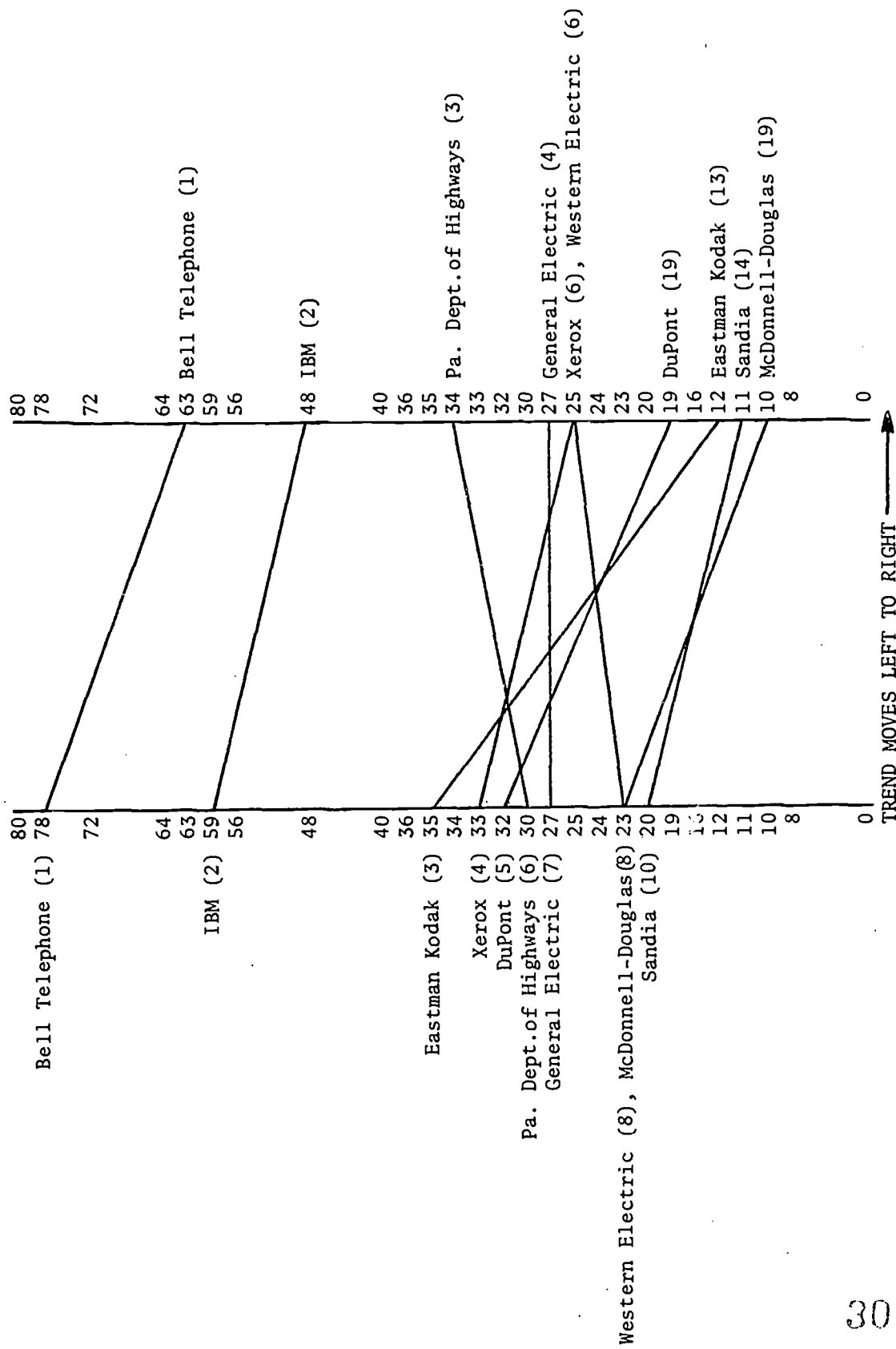


FIGURE - 4 JOB TREND LINE: FIRST TO PRESENT (PART 1)

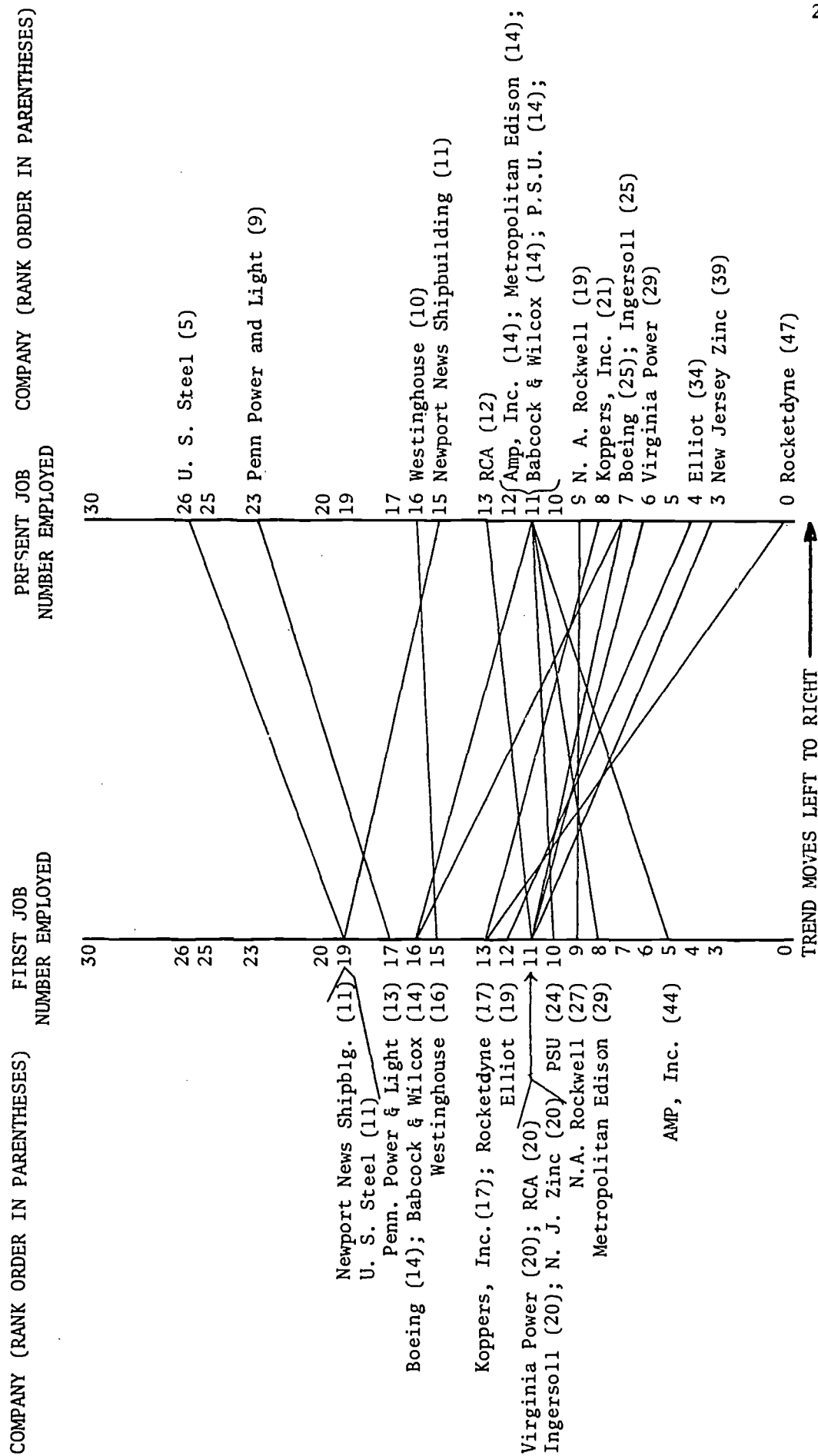


FIGURE — 5 JOB TREND LINE: FIRST TO PRESENT (PART 2)



TABLE 4  
EMPLOYERS THAT HIRED FIVE OR MORE GRADUATES  
FOR THEIR FIRST JOBS

<u>Company</u>	<u>First Job # of Grads</u>	<u>Rank Order</u>	<u>Only Job # of Grads</u>	<u>Rank Order</u>	<u>Present Job # of Grads</u>	<u>Rank Order</u>
Air Products	7	31	2	35	3	39
Alcoa	7	31	0		2	42
American Chain & Cable	5	44	2	35	4	34
AMP, Inc.	5	44	3	31	11	14
Babcock and Wilcox	16	14	11	10	11	14
Bailey Meter	5	44	1	42	2	42
Bell Telephone	78	1	50	1	63	1
Bendix Aviation	6	36	2	35	6	29
Boeing	16	14	6	20	7	25
Copes-Vulcan, Inc.	5	44	2	35	3	39
Corning Glass Works	6	36	3	31	4	34
Department of Defense	7	31	3	31	7	25
Dravo Corporation	8	29	2	35	5	33
DuPont	32	5	14	8	19	9
Eastman Kodak	35	3	9	13	12	13
Elliott Company	12	19	1	42	4	34
General Electric	27	7	12	9	27	4
Gerwin Engineers	6	36	4	27	6	27
Gilbert Assoc., Inc.	7	31	5	23	7	25
General Motors Corp.	6	36	2	35	4	34
Hazeltine	7	31	1	42	1	45
I. B. M.	59	2	38	2	48	2

<u>Company</u>	<u>First Job # of Grads</u>	<u>Rank Order</u>	<u>Only Job # of Grads</u>	<u>Rank Order</u>	<u>Present Job # of Grads</u>	<u>Rank Order</u>
Ingersoll-Rand Co.	11	20	5	23	7	25
Koppers Co., Inc.	13	17	8	15	8	21
Link Aviation	5	44	1	42	1	45
Link Belt Co., Div. FMC	6	36	0	46	0	47
McDonnell-Douglas Corp.	23	8	6	20	9	19
Malpar	6	36	0	46	0	
Metropolitan Edison	8	29	8	15	11	14
N A Rockwell Mfg.	9	27	7	19	9	19
National Security Agency	10	23	8	15	8	21
New Jersey Zinc Co.	11	20	3	31	3	39
Newport News Shipbuilding	19	11	15	6	15	11
Pa. Dept. of Highways	30	6	29	3	34	3
Pa. Electric	6	36	4	27	8	21
Penn Power & Light	17	13	16	4	23	9
Pratt & Whitney	6	36	5	23	6	29
Proctor & Gamble	10	24	8	15	8	21
Penn State University	10	24	9	13	11	14
Potomac Edison	9	27	4	27	4	34
RCA	11	20	6	20	13	12
Rocketdyne	13	17	0	46	0	47
Sandia Corp.	20	10	10	12	11	14
Textile Machine Works	10	24	2	35	2	42

<u>Company</u>	<u>First Job # of Grads</u>	<u>Rank Order</u>	<u>Only Job # of Grads</u>	<u>Rank Order</u>	<u>Present Job # of Grads</u>	<u>Rank Order</u>
U. S. Steel	19	11	15	6	26	5
Virginia Power & Electric	11	20	4	27	6	29
Western Electric Co.	23	8	11	10	25	6
Westinghouse Elec. Co.	15	16	5	23	16	10
Xerox	33	4	16	4	25	6
TOTALS	750a		378b		545c	

- a. This is 68.36% of the total number of graduates reporting first jobs (1097).
- b. This is 75.60% of the total number of graduates reporting only jobs (500).
- c. This is 54.33% of the total number of graduates reporting present jobs (1003).

### EMPLOYEE-EMPLOYER FLOW RELATIONSHIPS

In examining employer-employee characteristics, it is of some interest to ascertain the extent to which the graduates "flow" into and out of positions with a particular employer. This flow is illustrated in Figure 6.

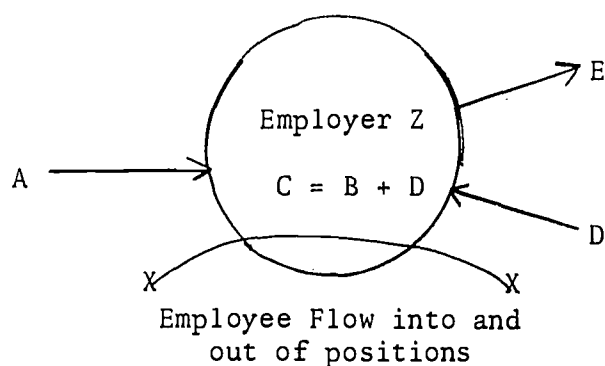


Fig. 6

In Figure 6, the variables are:

- A = first jobs;
- B = only jobs\* (A - E);
- C = present jobs (A + D - E);
- D = later jobs (C - B);
- E = first job exit (A - B);
- X = in-and-outers.

\* The respondents were not directly asked if they had an ONLY JOB. This was assumed to be true in those cases where the respondents reported the same job for their answers to the two categories of "first job" and "present job" in the questionnaire (See Appendix IV).

Total Flow Toward Employer (TFTE): From these variables, the Total Employee Flow can be examined. From Figure 6, it is seen that the input of graduates to employer Z consists of three components, namely:

1. The First Jobbers - those graduates who accepted their first post-graduation job with employer Z (variable A);
2. The Later Jobbers - those graduates who took a position with employer Z, after they had an earlier post-graduation job, and remained with employer Z (variable D);
3. The In-And-Outers - those graduates who took a position, after their first job, with employer Z, but left for another job before this study was conducted (variable X).

The Exiting of graduates from employer Z consists of two components, namely:

4. The First Job Exiters - those graduates who accepted their first post-graduation job with employer Z and left for another position before this study was conducted (variable E).
5. The In-And-Outers - described in three above.

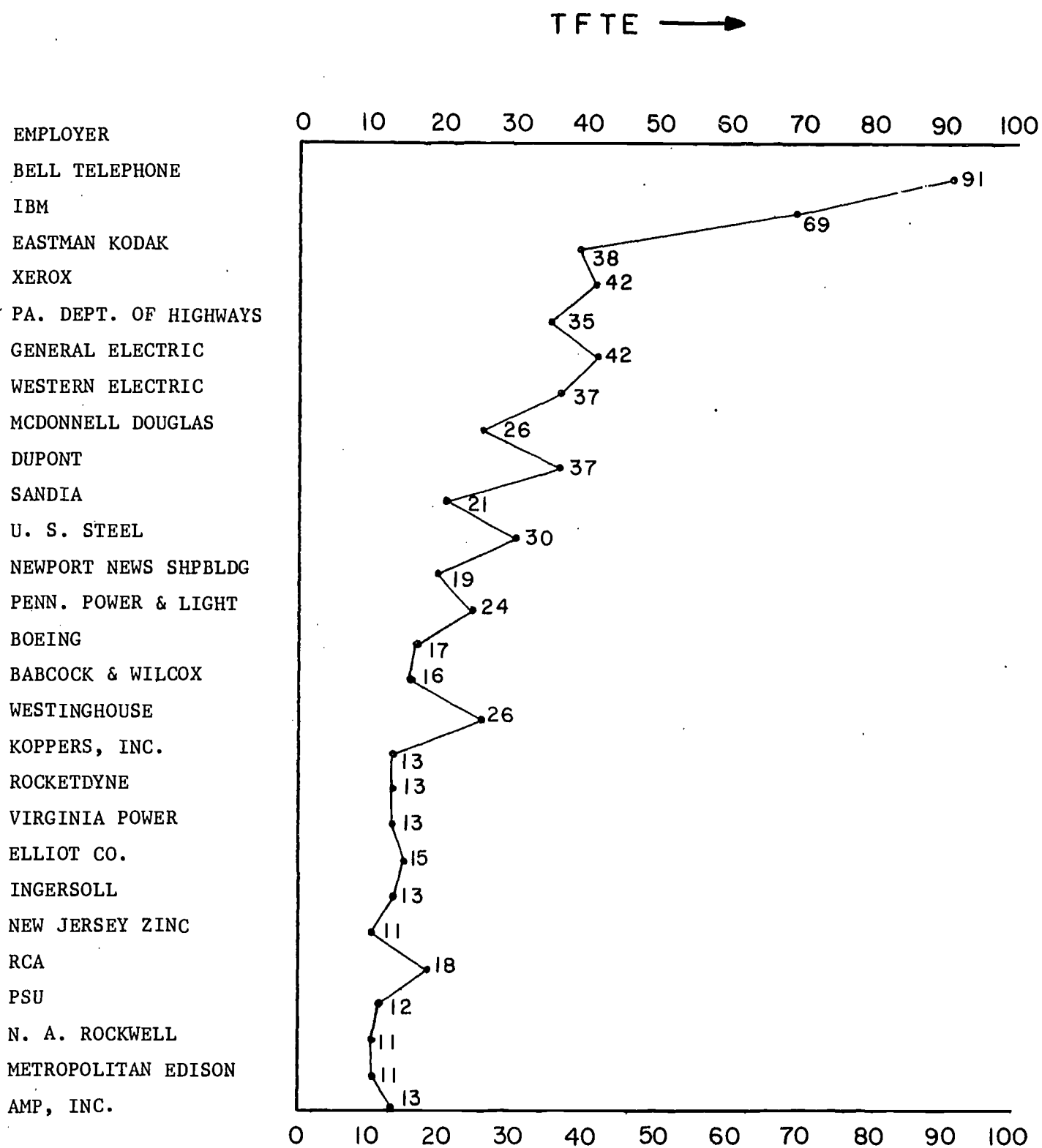
Note that there are two unidirectional input variables (A and D), one unidirectional output variable (E) and one bidirectional variable (X). Variable X\*, because of its bidirectional characteristics, is related to both the input and output of the total employee flow.

\*In this investigation, variable X is not readily determinable because of the manner in which the data was obtained. The graduates were asked to provide the names of their first and present employers only, which means we cannot identify the "in-and-outers" in a direct fashion. They could have been identified as a group from those graduates who had more than two jobs, but we elected not to pursue this method because the mean number of jobs held by the graduates falls below 3.0 for most of the graduation classes. Therefore, we felt the possibility of variable X playing a significant part in the total employee flow for a specific employer is not too great.

The relationship from which Total Flow Toward Employer (TFTE) for a given employer can be calculated is,

$$TFTE_z = A + D$$

Inspection of the relationship shows that it is directly related to the number of First Jobbers and Later Jobbers. Therefore, those employers who had a large number of employees would most likely have the highest TFTE values. The TFTE values for the 27 employers are graphically displayed in Figure 7 and listed in Appendix VII. The employers with the four largest values of TFTE, in descending order, are Bell Telephone, IBM, Xerox, and General Electric. It is of interest to note that all of these are giant national-type corporations which hire a relatively large number of technicians.



TOTAL FLOW TOWARD EMPLOYER  
FOR THE TOP 27 EMPLOYERS

FIGURE - 7

Employee-Employer Job Mobility Ratio (EEJMR): Having Identified the total flow toward the employer, we can establish a ratio of TFTE to the number of graduates presently working for that employer. This ratio can be called the Employee-Employer Job Mobility Ratio (EEJMR). The relationship is,

$$EEJMR = \frac{TFTE}{C_z} = \frac{A + D}{(A + D - E)}$$

where

$C_z$  = total present jobbers

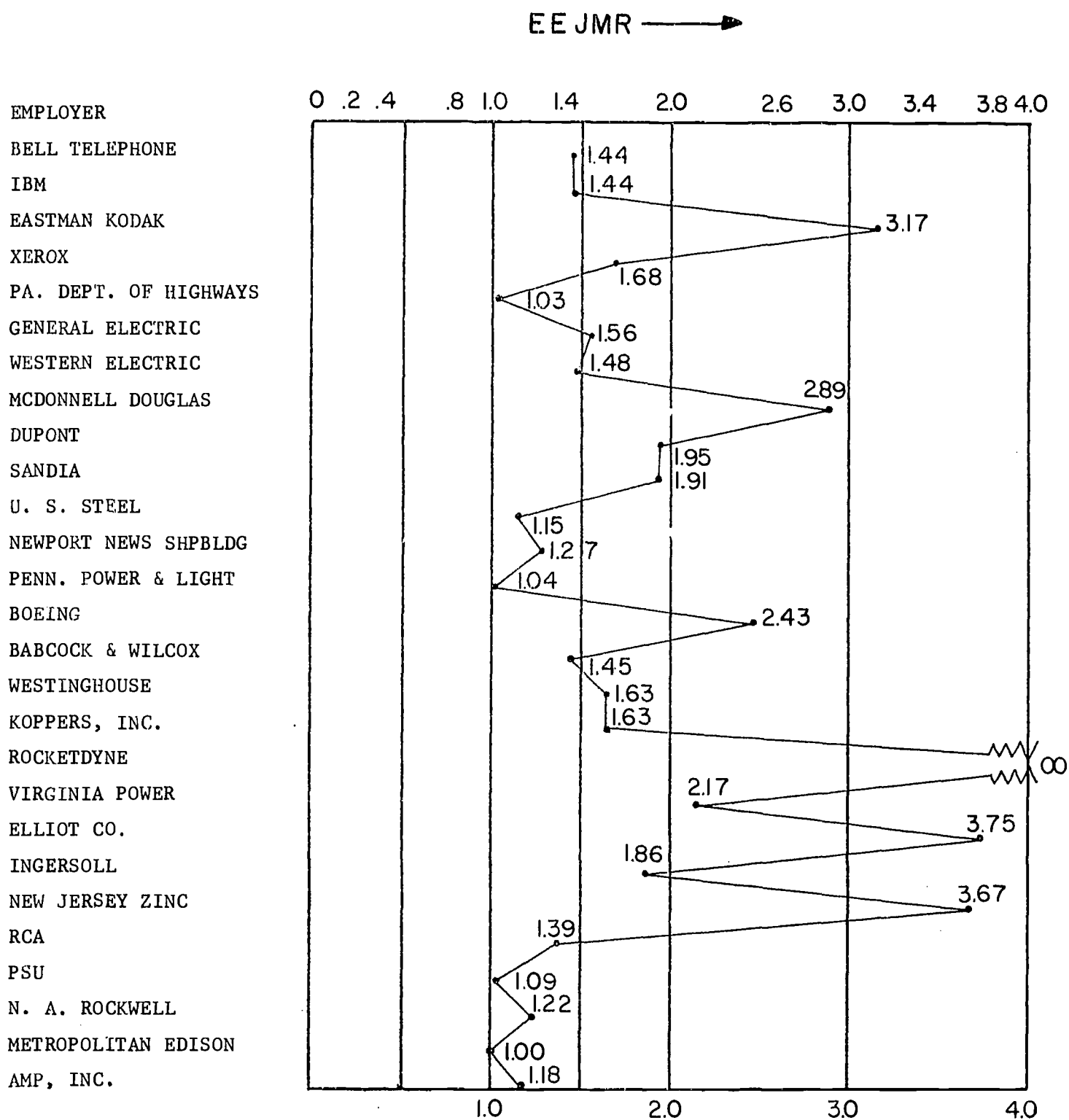
$A + D$  = total flow toward employer

$A + D - E$  = total flow toward employer minus outflow.

Examination of the above equation shows that the minimum ratio is one, which occurs when everyone who entered employer Z remained there. Since the variables A and D appear in both the numerator and denominator of the equation, only the number of graduates leaving (variable E) has an effect upon EEJMR. Since the value of E is subtracted from the denominator, an increase in its size will increase the ratio value. Therefore the value of EEJMR varies directly with the change in the number of first job exit graduates.



The values of TFTE and EEJMR have been found for the top 27 employers and are listed in Appendix VII and the EEJMR values are graphically displayed in Figure 8. The size of EEJMR is directly related to the rate of turnover of the graduates working for these employers. For example: for every graduate presently employed at Bell Telephone, there has been 1.44 graduates employed there at some time. The employers with the highest graduate turn-over rate (i.e. EEJMR exceeds 2.00) include Eastman Kodak, McDonnell Douglas, Boeing, Rocketdyne, Virginia Power, Elliot Company, and New Jersey Zinc Co. Notice that the EEJMR value for Rocketdyne is infinite because there are no graduates presently employed by them.



THE EMPLOYEE - EMPLOYER JOB MOBILITY  
RATIO FOR THE 27 TOP EMPLOYERS

FIGURE - 8

Employer Later Job Propensity (ELJP): Another ratio which enables us to identify an employer's characteristics is the Employer Later Job Propensity (ELJP). This ratio is,

$$ELJP = \frac{N_{\text{present jobbers}}}{N_{\text{only jobbers}}} = \frac{A + D - E}{A - E}$$

Observation of the above relationship shows the quantity  $(A - E + D)$  is the total flow toward the employer minus the outflow from the employer, and  $A - E$  is the initial flow toward the employer minus the outflow from the employer. When this ratio is equal to unity, all the present jobbers are only jobbers.

Inasmuch as the term  $(A - E)$  appears in both parts of the ratio, changes in either of these variables will not affect the size of ELJP. But variable  $D$ , which represents the number of later jobbers, appears only in the numerator. It should be pointed out, for the purpose of emphasis, that the later jobbers are "experienced graduates." Since an increase in the number of later jobbers will cause ELJP to also increase, it is seen that the magnitude of ELJP reflects the extent to which a particular employer has been hiring experienced graduates (i.e. later jobbers).

The values of ELJP for the top 27 employers are listed in Appendix VII and are graphically displayed in Figure 9. It should be noted that the ELJP value for Rocketdyne is misleading, the value of infinity is the result of its ratio being 0/0.

Examination of Fig. 9 shows that the companies that have the greatest propensity for hiring later jobbers (in descending order) are: Elliot Company, Amp, Inc.; Westinghouse; Western Electric; General Electric; and RCA. It is interesting to note that these employers are, for the most part, associated with the electrical-electronics industry.

ELJP →

## EMPLOYER

BELL TELEPHONE

IBM

EASTMAN KODAK

XEROX

PA. DEPT. OF HIGHWAYS

GENERAL ELECTRIC

WESTERN ELECTRIC

MCDONNELL DOUGLAS

DUPONT

SANDIA

U. S. STEEL

NEWPORT NEWS SHPBLDG

PENN. POWER &amp; LIGHT

BOEING

BABCOCK &amp; WILCOX

WESTINGHOUSE

KOPPERS, INC.

ROCKETDYNE

VIRGINIA POWER

ELLIOT CO.

INGERSOLL

NEW JERSEY ZINC

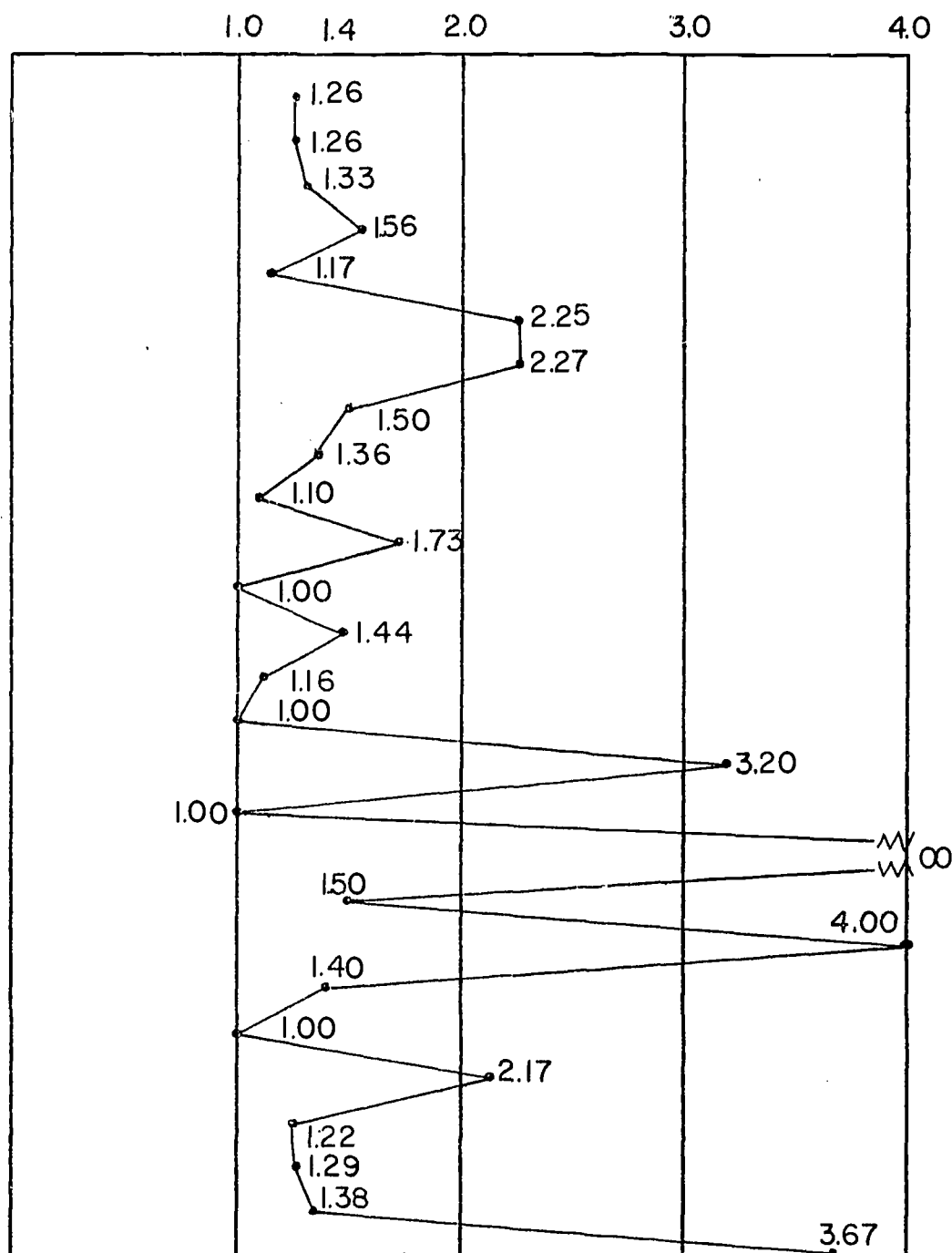
RCA

PSU

N. A. ROCKWELL

METROPOLITAN EDISON

AMP, INC.



THE EMPLOYER LATER JOB PROPENSITY  
FOR THE TOP 27 EMPLOYERS.

44

FIGURE - 9

Employer First Job Propensity (EFJP): The Employer First Job Propensity (EFJP) provides us with another employer characteristic. This ratio is concerned with identifying those employers that have the greatest propensity for hiring "inexperienced" graduates (i.e. first jobbers). The ratio is,

$$EFJP = \frac{A + D}{A}$$

where

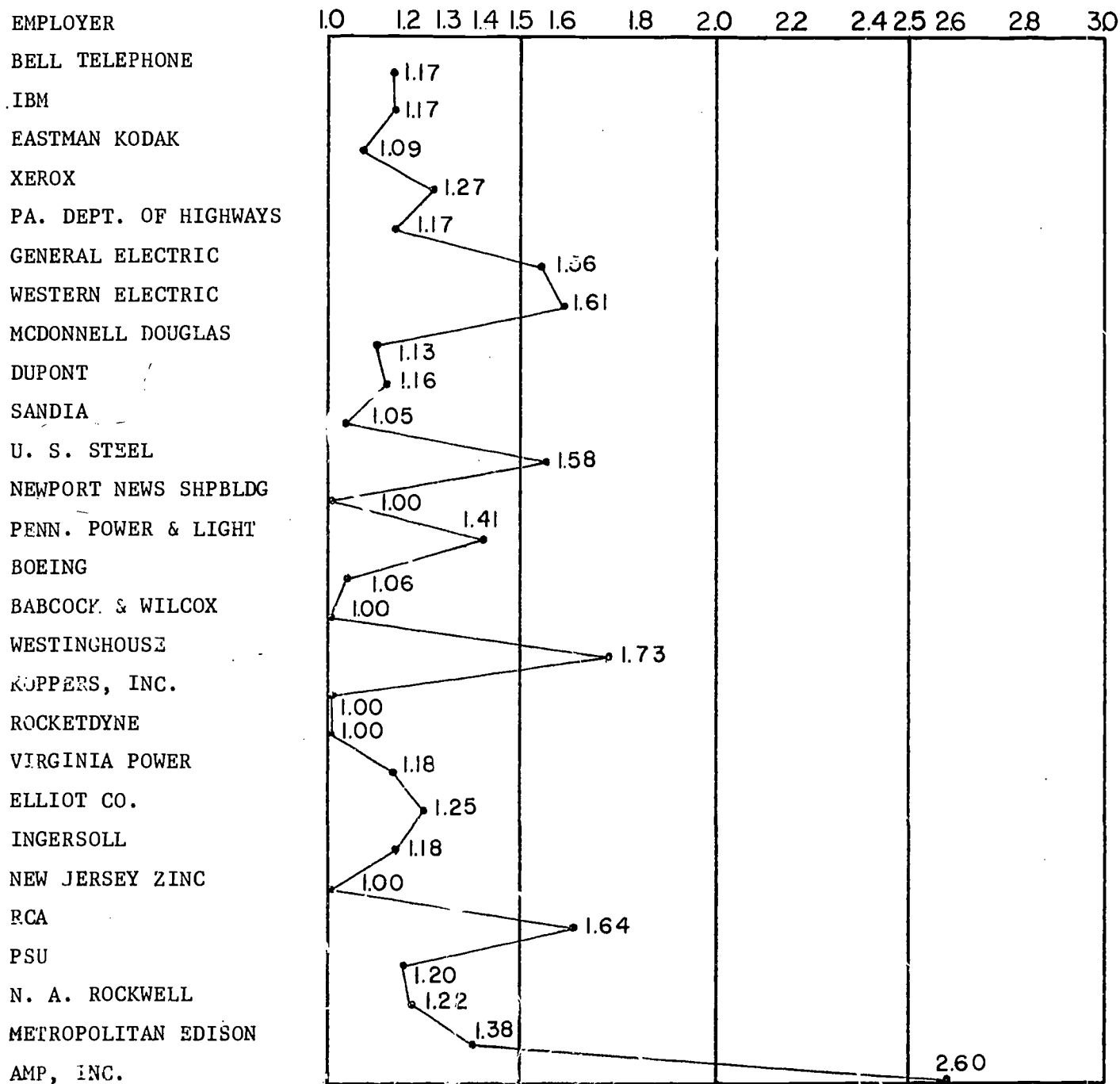
A = first jobbers

A + D = sum of first jobbers and later jobbers

When the above ratio is equal to unity, it indicates that the employer is hiring only first jobbers. This implies that the employer has a strong propensity for "inexperienced" graduates. When EFJP becomes greater than unity, it reveals that the employer is hiring some later jobbers. Therefore employers with EFJP values closest to unity are those that have a history of hiring proportionately greater numbers of first jobbers over later jobbers.

The EFJP values for the top 27 employers are listed in Appendix VII and graphically displayed in Figure 10. Five employers had EFJP values of unity, hiring only first jobbers. They are: Newport News Shipbuilding; Babcock and Wilcox; Koppers, Inc.; Rocketdyne; and New Jersey Zinc.

EFJP →



EMPLOYER FIRST JOB PROPENSITY  
FOR THE TOP 27 EMPLOYERS

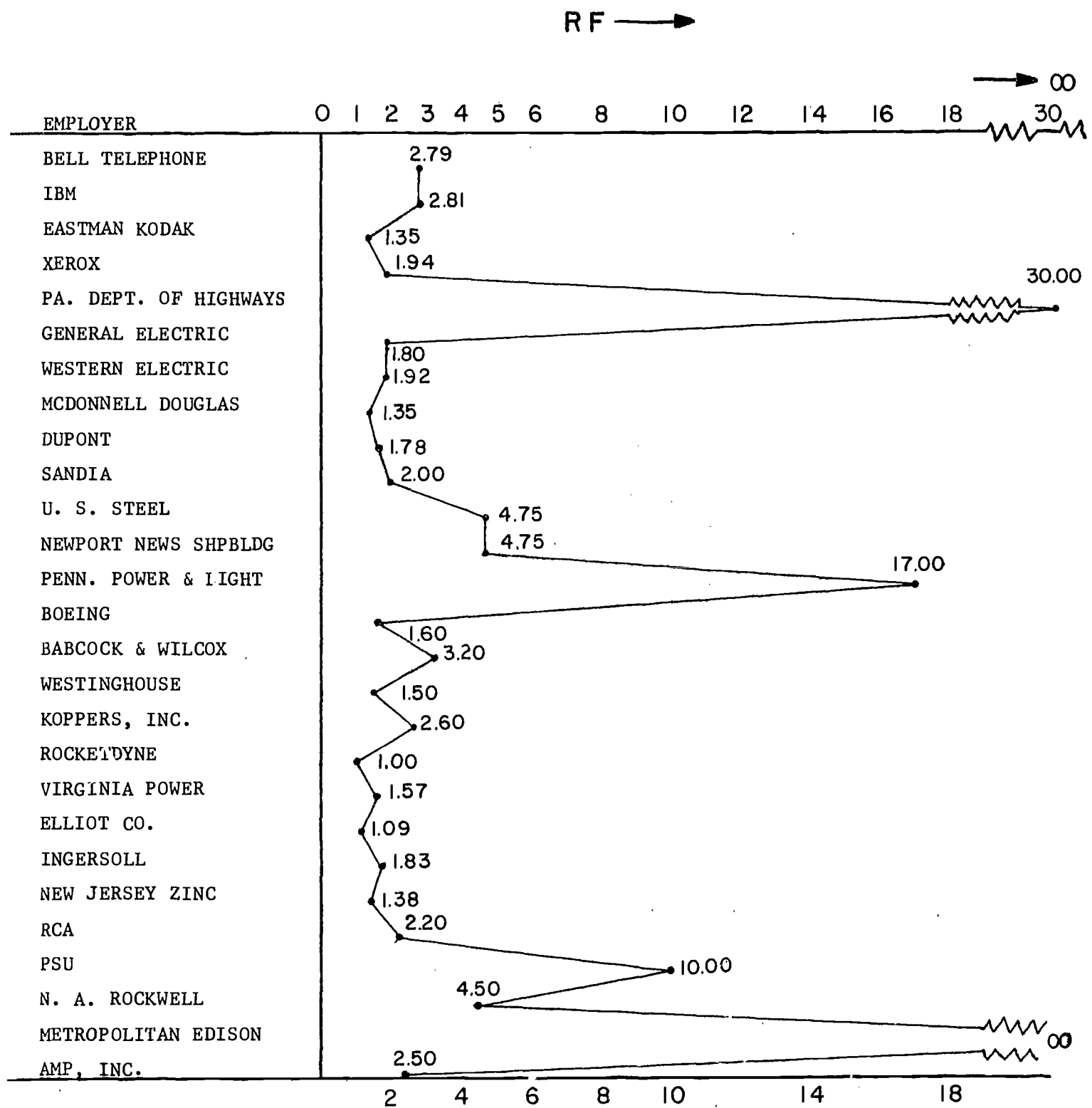
Retention Factor (RF): The final employer characteristic to be examined in this report is the Retention Factor (RF), which is the ratio of the number of first jobbers to the number of first job exits. The equation is,

$$RF = \frac{A}{E}$$

RF would be infinite in the case where zero first jobbers left that employer. This would be complete or "perfect" retention. Minimum retention would be the case where all of the first jobbers left that employer and  $RF = 1$ . Therefore, the magnitude of RF is directly related to the retention rate of the first jobbers.

RF for the top 27 employers are displayed in Fig. 11 and listed in Appendix VII. The employers with the largest RF (i.e. have the greater retention of first jobbers) are (in descending order): Metropolitan Edison, Pennsylvania Department of Highways, Pennsylvania Power and Light, and The Pennsylvania State University.





RETENTION FACTOR OF  
THE 27 TOP EMPLOYERS

### WHERE THE GRADUATES LIVE

In the Commonwealth: Of the 1177 graduates with reporting residences in this study, 779 (66.18 percent) cited their present addresses as being in Pennsylvania. The distribution of the in-state residences on a county-by-county basis is shown in Appendix II. A total of 56 counties in the commonwealth have one or more of the graduates residing within their boundaries at the time of the survey (winter of 1969-70).

Figure 12 illustrates the distribution of graduates throughout the commonwealth. The figures shown within each county represent the percentage of the total in-state graduates that reside within that county. This was determined from the following relationship:

$$P.C._{cx} = \frac{n_{cx}}{N_{is}} \times 100 = \frac{100n_{cx}}{779}$$

where

$P.C._{cx}$  = percent of in-state graduates living in county x;

$n_{cx}$  = number of graduates residing in county x;

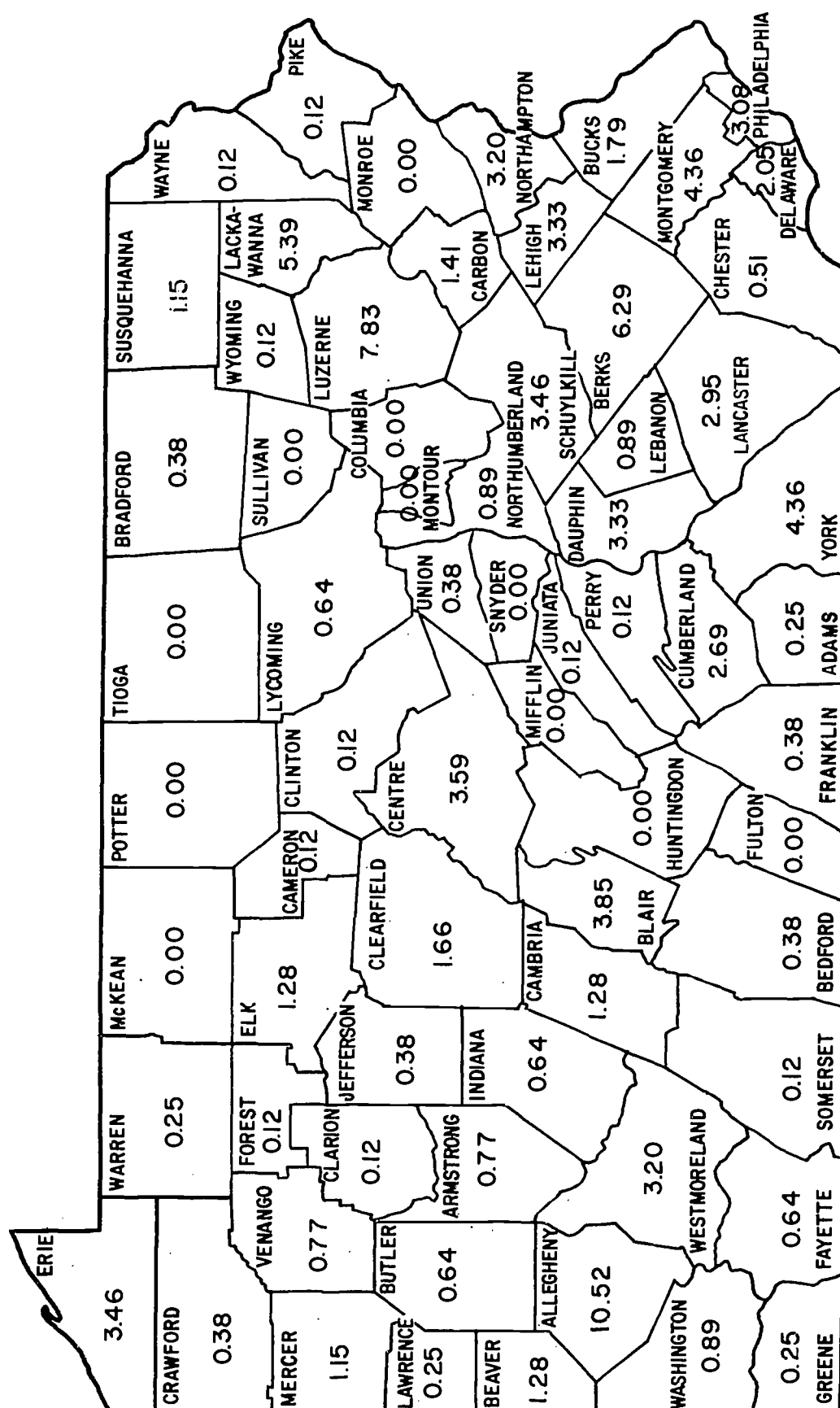
$N_{is}$  = total number of graduates living in state (Pennsylvania)  
= 779.

The bar graph in Figure 13 depicts the number of graduates residing in each of the top twenty counties. Of interest is the finding that 600 of the 779 in-state graduates (77.02 percent) reside in the twenty counties represented in Figure 5. Therefore the remaining 28.98 percent (or 179 in-state graduates) are distributed among (56 - 20) 36 other counties.

An inspection of the distribution of residences shown in the Commonwealth map of Figure 12 show several areas of concentrations. The five major ones are:

1. Greater Philadelphia Region: This includes the counties of Philadelphia, Delaware, Chester, Lancaster, Berks, Lehigh, Northampton, Bucks, and Montgomery. These nine counties which lie in a crescent pattern around the city of Philadelphia are the residences of 27.56 percent of the graduates that live in the commonwealth.
2. Wilkes-Barre--Scranton Region: This includes the counties of Lackawanna, Luzerne, Carbon, and Schuylkill. These four counties are the residences of 18.09 percent of the graduates that live in the commonwealth.
3. Greater Pittsburgh Region: This includes Allegheny and Westmoreland Counties, which are located in the southwestern section of the state. They serve as residences for 13.72 percent of the in-state graduates.
4. Harrisburg-York Region: Dauphin, York, and Cumberland counties are considered in this group. The residences of 10.38 percent of the in-state graduates are found in these three counties.
5. Altoona-State College Region: This includes the two counties of Blair and Centre, where 7.44 percent of the in-state graduates have permanent addresses.

The five major areas listed above serve as residences for 65.19 percent of the in-state graduates. The two easternmost regions (Greater Philadelphia and Greater Wilkes Barre--Scranton) account for the greatest portion with 45.65 percent of the total in-state graduates residing there. As might be expected, these are also the five regions where the majority of the population in the commonwealth is located.



**FIGURE-12**

PSU ASSOCIATE DEGREE GRADUATES (1955 TO 1969) RESIDING IN PENNSYLVANIA. FIGURES ARE THE PERCENTAGE OF IN-STATE GRADUATES (779 OF 1177) LIVING IN EACH COUNTY.

COUNTIES (TOP 20)

ALLEGHENY

LUZERNE

BERKS

LACKAWANNA

MONTGOMERY

YORK

BLAIR

CENTRE

SCHUYLKILL

DAUPHIN

LEHIGH

WESTMORELAND

NORTHAMPTON

PHILADELPHIA

LANCASTER

CUMBERLAND

DELAWARE

BUCKS

CLEARFIELD

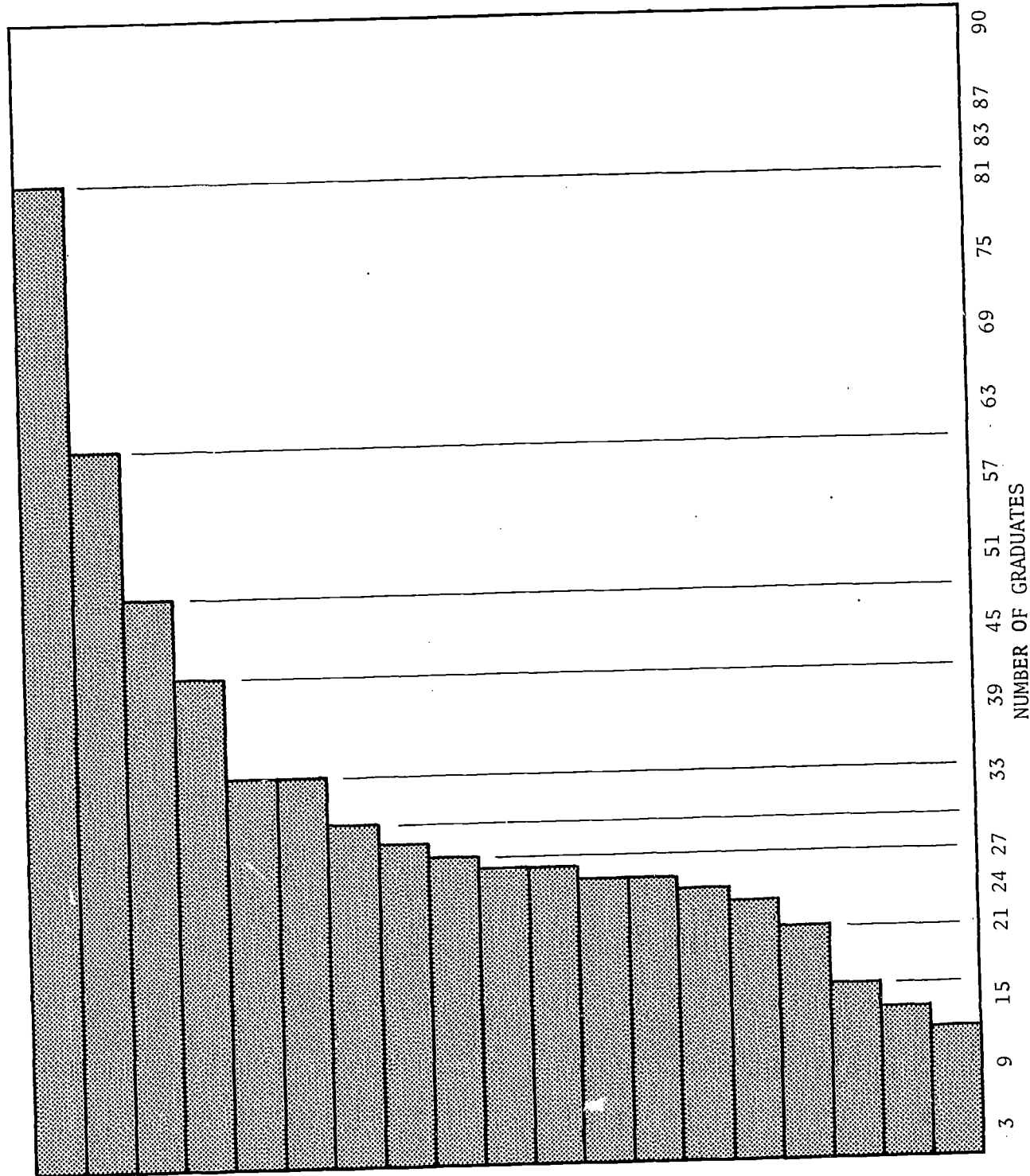


FIGURE 13 DISTRIBUTION OF GRADUATES RESIDENCES IN THE TOP 20 COUNTIES

Out-of-State: A total of 398 graduates (which represents 33.82 percent of the reporting graduates) reported residences outside the commonwealth. Appendix III displays the distribution of out-of-staters, a rank ordering of the states in terms of the number of graduates living in them, and the percent of the 398 out-of-state graduates living in each. Addresses in 35 states and the District of Columbia were given by this group.

The map of continental United States shown in Figure 14 displays the distribution of the out-of-state graduates by percent of out-of-state graduates in that state, i.e.:

$$P.C._{sx} = \frac{n_{sx}}{N_{os}} \times 100 = \frac{100n_{sx}}{398}$$

where

$P.C._{sx}$  = percent of out-of-staters living in state x;

$n_{sx}$  = number of graduates living in state x;

$N_{os}$  = total number of graduates living outside of Pa. = 398.

The bar graph in Figure 15 displays the distribution of out-of-state residences in descending order. Of interest is the finding that 59.77 percent (i.e. 243) of the out-of state graduates reside in the six states bordering the commonwealth (New York, New Jersey, Delaware, Maryland, West Virginia, and Ohio). This can be explained in terms of the total number of graduates: of the 1177 graduates reporting addresses in this investigation, 20.21 percent of them presently live in the six states bordering Pennsylvania.

The ten top-ranking states in terms of graduates residences account for 81.12 percent (323) of the out-of-staters. These include five of the six bordering states (West Virginia is not in the upper ten). The other five are Virginia, California, Connecticut, Illinois, and New Mexico. The remaining 18.88 percent (66) graduates are thinly distributed among the remaining 25 states (a ratio of 2.64 graduates per state).



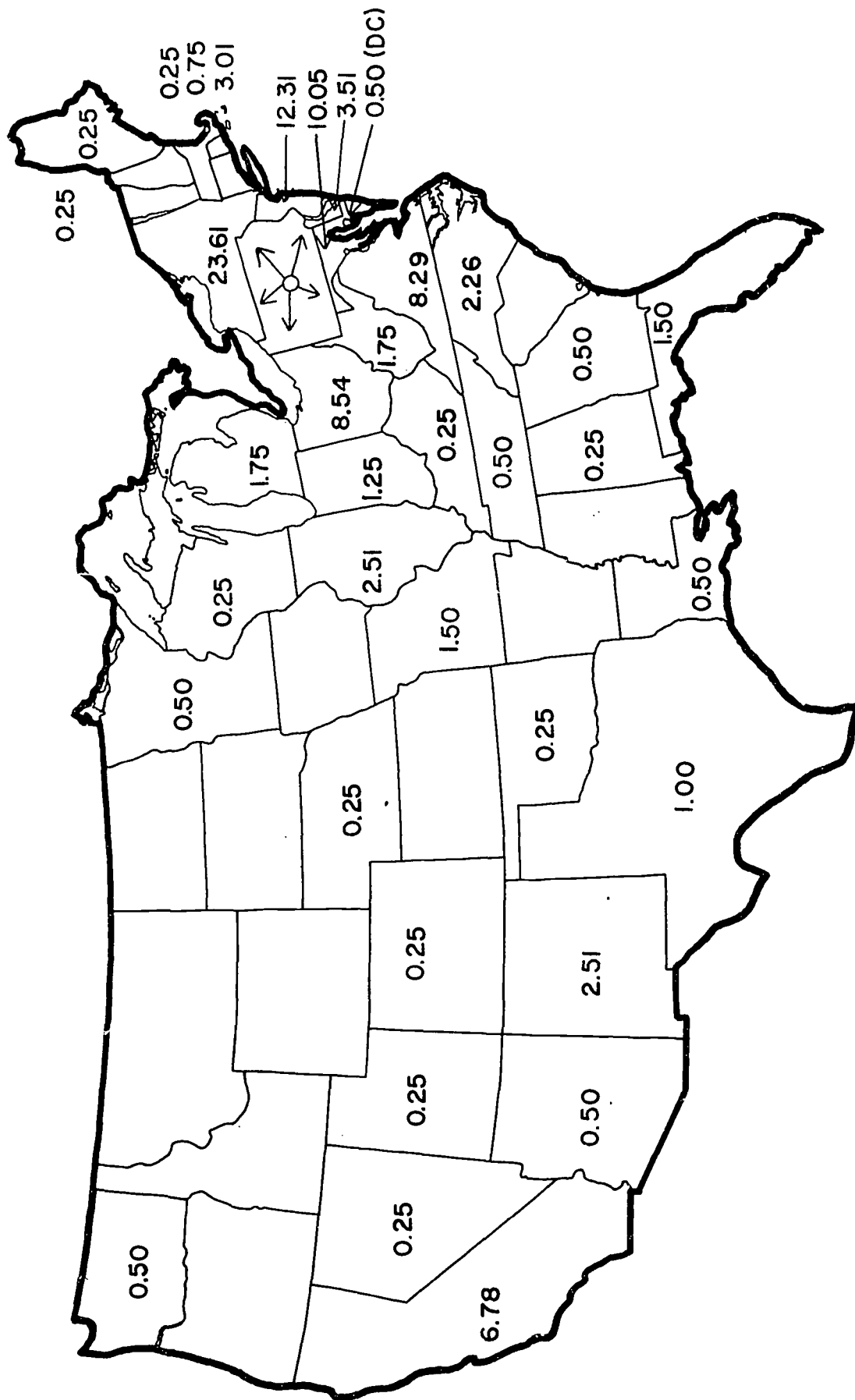


FIGURE - 14

PSU ASSOCIATE DEGREE GRADUATES (1955 TO 1969) LIVING OUTSIDE PENNSYLVANIA. FIGURES ARE THE PERCENTAGE OF OUT-OF-STATE GRADUATES (398 OF 1177) LIVING IN EACH STATE (35 OF 50).

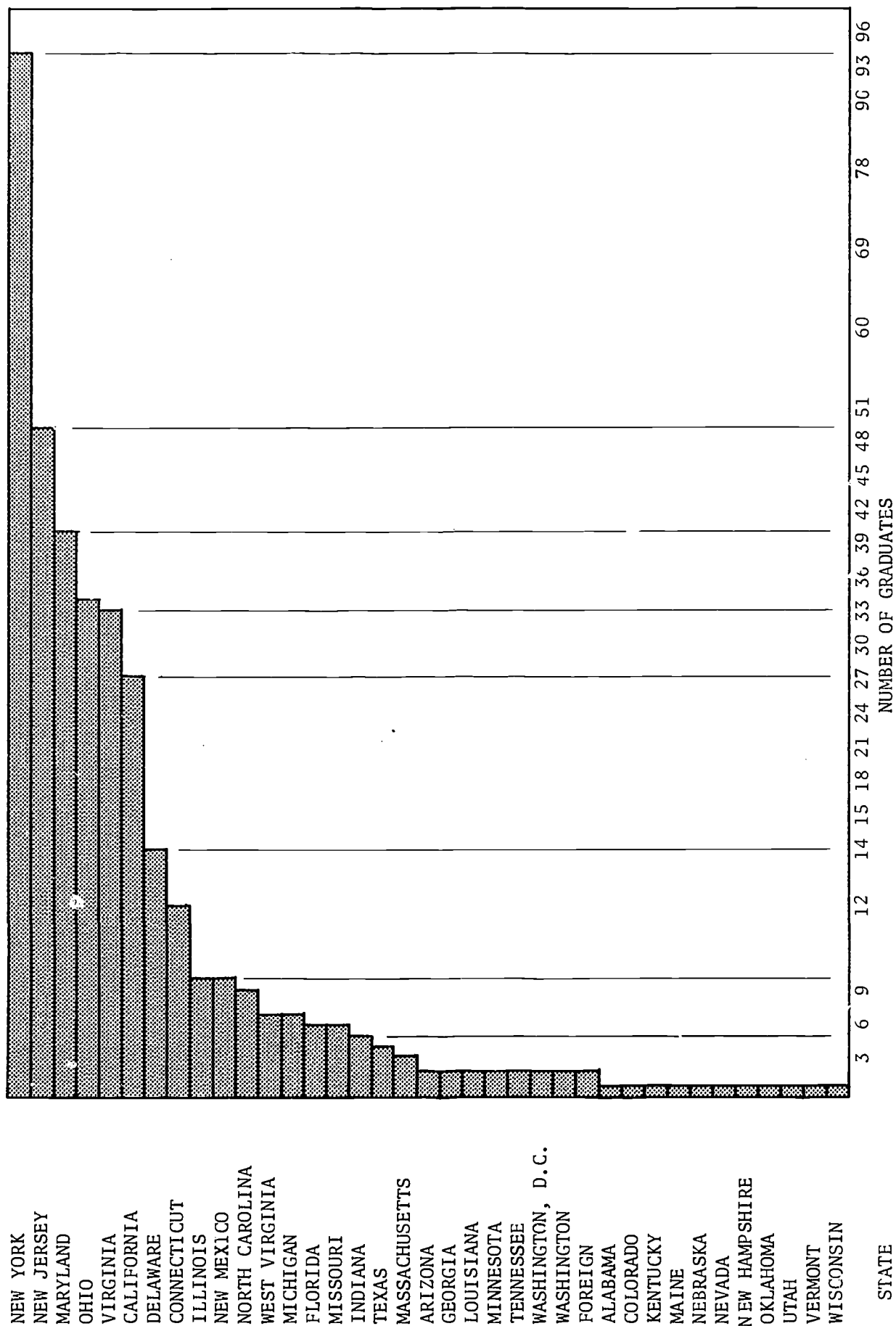


FIGURE - 15 GRADUATES LIVING OUTSIDE PENNSYLVANIA

## CONCLUSIONS

Four aspects of employment trends were examined. It was found that about half of the first post-graduation jobs were obtained with 23 out of more than 300 employers. The distribution of jobs is indicated by the employee-employer ratio, which was about 24/1 for the 23 top employers but only 1.86/1 for the remaining minor employers. It was found that all of the top employers were large business enterprises and public service concerns. Almost 42 percent of the present jobs were with 20 top employers, and the employee-employer ratio was about 21/1 for the top companies and about 1.5/1 for the remaining 385 minor employers. For graduates having only one post-graduation job, just 62 percent of them were employed by twenty-two employers. The employee-employer ratios were about 14/1 for the top employers and only 1.55/1 for the 121 minor employers. The analysis of trends from first to present job found that nine top employers underwent a significant decrease in number of graduates employed in present jobs (as compared to number employed for first jobs), whereas three employers displayed the opposite trends. The remaining top employers did not experience substantial changes in either direction.

A number of findings relative to employee-employer flow relationships can be reported. Four employers (Bell Telephone, IBM, Xerox, and General Electric) had the largest Total Flow Toward Employer (TFTE). The employers with the highest turnover rate, as expressed by the Employee-Employer Job Mobility Ratio (EEJMR), are Eastman Kodak, McDonnell-Douglas, Boeing, Rocketdyne, Virginia Power, Elliot Company, and New Jersey Zinc Company. Those companies that have a history of hiring a proportionately

greater number of experienced graduates (as opposed to first jobbers), expressed by a relationship termed Employer Later Job Propensity (ELJP), are: Elliot Company, Amp, Inc., Westinghouse, Western Electric, General Electric, and RCA. Another relationship, termed Employer First Job Propensity (EFJP) showed that five employers employed only first jobbers, they were: Newport News Shipbuilding, Babcock and Wilcox, Koppers, Inc., Rocketdyne, and New Jersey Zinc Company. A ratio called the Retention Factor was used to identify those employers that have the greatest retention of first jobbers; they were: Metropolitan Edison, Pennsylvania Department of Highways, Pennsylvania Power and Light, and The Pennsylvania State University.

The last section of the report dealt with where the graduates live at the present time. It was found that about 66 percent of the graduates live in the commonwealth and about two-thirds of these lived in five major areas in the state. These regions were: Greater Philadelphia, Wilkes-Barre--Scranton, Greater Pittsburgh, Harrisburg-York, and Altoona-State College. The out-of-staters, which constitutes about 34 percent of all the graduates, live in 35 states and the District of Columbia. However, about six-tenths of the out-of-staters were found to be living in the commonwealth border states of New York, New Jersey, Delaware, Maryland, West Virginia, and Ohio.

In conclusion, this report summarizes a number of characteristics dealing with inter-relationships between the graduates and their employers, and should be of some interest to program planners in the commonwealth campuses.

## REFERENCES

1. Cochran, William G. Sampling Techniques: 2nd Edition, New York: John Wiley and Sons, Inc., 1963.
2. Klugh, Henry E. Statistics: The Essentials for Research, New York: John Wiley and Sons, Inc., 1970.

APPENDICES

## APPENDIX I

## EMPLOYERS OF 1955-69 GRADUATES OF THE EET AND DDT PROGRAMS

<u>Name of Company</u>	<u>First Job</u>	<u>Only Job</u>	<u>Present Job</u>
AAJ Corporation			1
ACCO			1
Accurate Bushing Co.			1
A. C. & S. Inc.	1	1	2
Acme Electric Corp.	1	1	1
Aero Flow Dynamics			2
Air Products Inc.	7	2	3
Airco Speer Carbon			2
Airpax Products Inc.	2		
Ajax Iron Works	1	1	1
ALCOA	7		2
Allegheny Power Service			1
Allied Chemical Corp.			1
Allis-Chalmers	1	1	1
Allstate Design & Dev.	1		2
Altoona Map & Blueprint	1		
A. L. Wiesenberger Assoc.			1
American Can Co.	3		1
American Chain & Cable	5	2	4
American Cyanide	1		
American Machine			1
American Photocopy	1	1	1
American Viscouse	1	1	1
AMP, Inc.	5	3	11

Anson Tool & Gauge			1
Anthracite Engineering	1		
A. O. Smith Corp.	1		
Armagast Welding	1		
ARMCO Steel Co.	1		1
Armstrong Cork & Tile	2	2	3
Arrow			1
Associated Testing Labs	1	1	1
Atlas Chemical Industries	3		2
Atlas Manufacturing Co.	1		
A T & T			1
Auburn Engineering	1		1
Auto Club of S. Calif.			1
Automation Industries	1		1
AVCO			1
Babcock & Wilcox	16	11	11
Bailey Meter Co.	5	1	2
Baldwin-Lima-Hamilton			1
Baltimore Board of Educ.			1
Barbey Electronics	1		
Bechtel Corporation	1	1	2
Bell Telephone	78	50	63
Bendix Aviation	6	2	6
Benson Equipment Corp.			1
Berg Electronics			3
Berger Assoc. Inc.			1
Berry Metal			1



Beryllium Corp.	1		
Bessemer & Lake	2	2	2
Bethlehem Steel	3	2	6
Birdsboro Corp.	2		1
Bishop Guilfoyle H.S.			1
Black & Decker Mfg. Co.	1		2
Blau-Know Power Piping	2		1
Boeing	16	6	7
Borg Warner	1	1	1
Bound Brook Bearing Co.			1
Bowers Consulting Engineers			1
Boyertown Auto Body Works	1	1	1
Brethern Volunteer Services			1
Brockway Glass Co.	1	1	2
Buchart-Horn	1		
Budd Co.			1
Burroughs	2		2
Buell Engineering	1	1	1
Bunker-Ramo Corp.			1
Burke Brothers	1		
Burron Medical Products	1	1	1
Byrne Associates	2		
Campbell Rea Hayes & Large			1
Capital Engineers	1		
Carborundum	1	1	1
Carew Corporation	1		
Carpenter Technical Corp.	2	2	3

Carrier Air Conditioning	1		
Caterpillar Tractor Co.	1		1
C & C Smith Lumber			1
Ceco Corporation	1		
Celanese Fibers			1
Centralab Electronics			1
Central Westmoreland Vo-Tech			1
Centre Video	1		
Certain-Teed Products			1
Cessna Aircraft			1
Chamberlain Manufacturing	1	1	2
Chandler-Evans Inc.			1
Charles Bruning Co.	1		
Charmin Paper Co.	1		
Chemcut Corporation	1		
Chevrolet			1
Chicago Bridge & Iron	1		1
Chicago Pneumatic Tool	4	1	1
Chilcoat & Company			1
Chrysler Corporation			1
Cincinnati Shoe			1
C. Kottcamp & Son, Inc.			1
Clapper Camper Inc.			1
Clark Brothers			1
Claster Steel			1
Clevate Corporation			1
Commonwealth of Pa.			1

Compar Albany Inc.			1
Compudyne Controls			1
Compugraphic Corporation			1
Computer Test Corp.			1
Consolidated Edison	1	1	1
Consultants & Designers			1
Continental Technical	1		1
Control Data Corp.			1
Copes-Vulcan Inc.	5	2	3
Corning Glass Works	6	3	4
Court Candies Inc.			1
Cove Structural Systems			1
Crane Co.			1
Craton Mfg. Co.			1
Crown Construction Co.	1		
Crucible Steel Inc.			1
Curtiss-Wright	3		
Cutler Hammer			1
Cutter-Karchez Shoes	1		
Cycloblower	1		1
Cyclops Corporation	1		1
Dana Corporation	1		1
Daystrom Instrument Inc.	1		
Dayton T. Brown Testing	1		
Delza Rubber Co.			1
Dept. of Defense	7	3	7
Dexion Inc.			1

Digital Equipment	3		
D.O.D. Edgewood Arsenal			1
Dorr-Oliver Inc.	3	1	2
Douglas Aircraft Co.	1		
Dravo Corporation	8	2	5
Dresser Manufacturing Co.	2		2
Dubovsky			1
DuPont	32	14	19
Duquesne Light Co.	4	3	3
Dynamics Corporation	1		
Eastman Kodak	35	9	12
Edgewater Baptist Church			1
Edwin L. Wiegand Co.	2		2
Electric Materials Co.	1	1	1
Electromagnetic Lab.			1
Electronics Assoc., Inc.	1		2
Electronics Components	1	1	1
Electronics, Missiles & Comm.	2		1
Electro-Rust-Proffing	2		
Elgin Electronics	2	2	2
Elliott Co.	12	1	4
Ellis Preston	1		
Erie Steel Products	2		
Erie Railroad Co.	1		
Erie Tech. Products	1	1	2
Erie Zoological Society	1		
Eriez Magnetics			1

Evans-Holcombe & Assoc.			1
Fairchild Semiconductors	1		
Fairfield Engineering Co.			1
Federal Aviation Admin.	4	4	7
Federal Electric			1
Federal Glass Co.			1
Firestone			1
Fisher Appliance Co.	1		
Flinchbaugh Products			1
F. L. Smithe Machine			3
Ford Motor Co.	1	1	1
Ford Music Store	1		
Foster Wheeler Corp.			3
Foxboro Co.			1
Frankle Engineering			1
Fuller Co.	1		1
F. W. Armitage Co.	3	1	1
GAF Corporation			3
Gannett, Fleming Corddry	1		1
Gardner-Denver Co.			1
Gateway Avionics Inc.	1		
General Cable	1		
General Electric	27	12	27
General Dynamics	1	1	1
General Instrument	1		
General Motors			1
General Precision	3		
General Railway Signal	1		

General Telephone Co. of Pa.			1
Gerwin Engineers	6	4	6
Gilbert Assoc., Inc.	7	5	7
GM	6	2	4
Glass Container Corp.			1
Glenshaw Specialities	1		1
Goerz Optical			1
Goodyear Tire & Rubber	1	1	2
GPI	2		
Graham Engineering Corp.	3	1	1
Great Northern Paper Co.			1
Greenville Steel Car Co.	1	1	1
Grove Manufacturing			1
Gulf Oil			1
Gus Welsh Inc.	1		
Gwin Engineers	1		2
Hamilton Watch Co.	3	2	3
Hammermill Paper	1		
Harlan Electric	1		1
Harris, Henry & Potter			1
Harrisburg Community College			1
Hazeltine	7	1	1
H. B. Dessinger, Inc.	1		
Hegins Valley Concrete	1	1	1
Heine Co.	1		
H. F. Huth Inc.	1		
H. J. Heinz Co.			1

Heli-Coil Corp.			1
Hershey Food Corp.			1
Hewlett-Packard			1
H. F. Teichman Engs.	1	1	1
H. Greenwald Co.	1		
High Welding			1
Hill Electronics	2	1	2
Hippenstall Co.			1
H. K. Porter Co.	1		
Hoffman Electronics	1		
Honeywell	2		2
Hood & Co., Inc.			1
Hottle & Assoc.	1	1	1
H. P. I./Muskin			1
H. R. B. Singer, Inc.	2		1
Hughes Aircraft Co.			1
Hunter, Campbell & REA	1		
HYCO Inc.	1		
IBM	59	38	48
Ideal Design Service			1
Industrial Diamond Powders			1
Industrial Engraving	1		
Industrial Transformer	1		
Industrial Solid State			1
Interdata Inc.			1
Internal Revenue Service	1	1	1

International Harvester	1		
International Salt Co.			1
ITE Circuit Breaker			1
ITT Semiconductors			1
Ingersoll-Rand Co.	11	5	7
James H. Matthews & Co.	2		1
Jenkintown School District	1		
Jersey Tab Card Corp.			1
J. E. Williamson Co.	1		
J. H. Matthews & Co.	1		
Jis Dairy Inn			1
J & L Steel Corp.	1	1	3
Johnson Bronze Co.			1
Johnson Service Co.			1
John Thatcher & Son	2		
Joy Manufacturing Co.	1	1	1
Kaiser-Mirawal	1	1	1
Kawecki Berylco Industries	1	1	2
Kennametal Inc.			1
Kennedy Van Saun Corp.	2	1	1
Kerotest Mfg. Co.	2		
Kerr Glass Mfg. Co.			1
Keystone Lamp	2		
Knox Glass	2		
Koppers Co., Inc.	13	8	8
Kroy Mfg. Co.			1
Landis Tool Co.	2		



Lear Siegler Inc.			1
Leeds & Northrup Co.	2	1	3
Lee Metal Production	1		
Lehigh Design			3
Lehigh Structural Steel	1		
Leithiser Co.			1
Leo A. Daly Co.			1
Leo C. Pelkus Inc.			1
L. Robert Kimball Engrs.	1	1	1
Lincoln Homes			1
Link Aviation	5	1	1
Link Belt Co., Div. FMC	6		
Litton Industries	1		
Lockheed Electric Co.	1		
Loftus Engr. Co.	1		
Lord Manufacturing	1	1	1
L. Robert Kimball	1		
Luria Steel Supply			1
Lutron Electronics Co.			1
Mack Truck Co.	1		1
Macomber & Faber	1		
M. A. I. Equip. Corp.			1
Marco Industries	1		
Martin Aircraft	1		
Martin & Flagg Engrs.	1		
Masonite Corp.			1
Maximum Machine Co.			1

McCoy Electric			1
McDonnell Douglas Corp.	23	6	9
McGraw Edison	1		1
McKay Chain Co.	1		
Mellon Institute	1		
Malpar Inc.	6		
Memorex Corp.			1
Metropolitan Edison	8	8	11
Michael Baker, Jr., Inc.	2	1	1
Microdot			1
Midland Ross Corp.	1	1	1
Miller Assoc.	2	2	2
Minneapolis Honeywell	1		
MIT	1	1	1
Mobil Oil Corp.			1
Modjeski & Masters			1
Monroe Woodberry H.S.			1
Moore Products Co.	1	1	2
Morris White Fashions			1
Mosser Industries			1
Mostech, Inc.			1
Motor Coils Mfg. Inc.			1
Motorola Inc.	1	1	1
M & T Co.	1		
Mullin & Lonnagen Assoc.			1
N. A. Phillips			1
N. A. Rockwell Mfg.	9	7	9

Nash Engr. Co.			1
National Fence Co.			1
National Forge Co.	1		
National Lead			1
National Mine Service			1
National Molasses			1
National Security Agency	10	8	8
Nautilus Industries			1
Naval Air Development	1	1	1
Naval Gun Factory			1
Nazareth Planing Mill Co.	1		
NCR	1	1	1
Nelson Stud Welding			1
New Enterprise Stone & Lime	1		
New Jersey Zinc Co.	11	3	3
Newport News Dry Dock	19	15	15
Newswanger Machine Co.	1		
New York Airbrake Co.	1		
NYU Medical Center	1	1	1
New York & Pa. Co.	1		
NIA Planning Co.			1
North American Aviation	4		
Northampton Area H.S.	1	1	1
Northeastern Engineering			1
Northwest Area Schools			1
Nuclear Equipment Corp.			1
NUMEC			1

Obenchain Corp.			1
Oberg Manufacturing			1
Ohio Brass Co.			1
Olin Corp.	1	1	1
Optical Scanning			1
ORL	1	1	3
Orr & Sembower	1		
Otis Elevator Co.	1		
Owens Illinois Fecher Sys.			1
Pa. Central			1
Pa. Dept. of Health	1	1	1
Pa. Dept. of Highways	30	29	34
Pa. Electric	6	4	8
Pa. Gas & Water Co.	1		
Page Comm. Engrs.	1	1	1
Pa. Liquor Control			1
Palmerton Telephone Co.			1
Parker Seal Co.			1
Pa. State Building Authority			1
Pa. State Police			1
Penn East Engrs.	1		
Penn Refrigerator Service			1
Penn Union Electric	1		
Penn Walt Corp.			1
Pennzoil United, Inc.			1
Peoples Natural Gas	1		
P. H. Glatfelter Co.			1
Philco	3		2

Phila. Electric	4	2	3
Phila. Gear Works	1		
Phila. Police Dept.			1
Picker Corp.			1
Pilgrim Luthern Church			1
Pillsbury Co.			1
Piper Aircraft	1	1	2
Pittsburgh Steel	1	1	1
Powder Metal Works			2
Power Eng. Corp.	1	1	1
Powers Regulator Co.			1
PPG Industries	3	2	5
P P & L	17	16	23
P R R	2		
Pratt & Whitney	6	5	6
Prestolite			1
Prismo Universal Corp.			1
Proctor & Gamble	10	8	8
Prudential			1
PSU	10	9	11
Pure Carbon Co.	2		
Potomac Edison	9	4	4
Quakertown Comm. Schoois			1
Ralston Purina			1
Raytheon Mfg. Co.	1		
RCA	11	6	13

Read Corp.	2	1	1
Reed Heating Co.	1		
Reeves Hoffman	4	1	2
Reliance Electric Co.	1	1	2
Remington Rand Univac	2		
Republic Aviation Corp.			1
Republic Steel Corp.	2	2	2
R. F. Schneider Pipe	2	1	1
Richard Brothers	1		
Riggi & Riggi Architects	1	1	1
R. M. Hunt, Inc.			1
Robertshaw Controls Co.	1		
Robina Industries Inc.			1
Rochester International Sys.			1
Rocketdyne	13		
Rockwell Mfg.	1		2
Ross Engineering	2	2	3
Rouzerville Fabrications			1
Royer Foundry & Machine			1
Sanders & Thomas Inc.	3	2	2
Sandia Corp.	20	10	11
Scan-Data Corp.			1
Scientific Products	1	1	1
S E E			1
Selas Corp.	1		
Sharon Steel Corp.	1		
Shenango Ceramics Inc.	1		

S. I. Handling System	1		
Singer General Precision	3	3	5
Singer Kearfott, Inc.			1
SKF, Inc.			2
Skinner Engineering			2
Skydyne Inc.	1		
Smith, Miller & Assoc.			1
Sobar Machine Co.	1		
Southern Conn. State College			1
Speer Carbon Co.	1	1	1
Sperry Gyro	1		
Sperry Rand	1	1	1
Spire Electric	1		1
Spang Industries			1
Square D Co.	1		
Stackpole Carbon Co.	3	2	2
Stanley G. Flagg Co.			1
State Road of W. Va.	4	1	1
Sterling Engr. Assoc.	1		
Stevens Manufacturing	1	1	1
Stone & Webster Eng.			1
St. Regis Paper Co.			1
Strick Trailer Corp.			1
Struthers Wells Corp.	1		1
Submarine Systems Inc.			1
Sunbeam Equipment Co.	1		
Super Fire Engineering			1
Swanson Erie	1		

Swindell-Dressler	1	1	1
Sybrow Corp.			1
Sylvania	2		
Syntron Co.	4		
Taccone Corp.	1		
Talon Inc.	1	1	1
Taylor Wharton Co.			1
Tem Pres Research			1
Texaco, Inc.			1
Textile Machine Works	10	2	2
Thatcher Glass Man. Co.	1		
Therm-Air Man. Co.	1		
Thiokol Chemical Corp.	1		
Timken Roller Bearing			1
Titzel Engineering Inc.			1
Tobyhanna Army Depot	1	1	1
Toledo Scale Co.	1	1	1
Topflight Tool Co.	1		
Trave Co.			1
Tresco Transformers	1		
Trumatic Machine & Tool	2		
Truscon Steel Co.	1		
TRW System Group	1	1	2
Tyrone School District			1
UGI Corp.	1	1	3
Underwriters Lab.			1
Union Carbide Corp.	4	3	4



Union Switch & Signal	3		
United Aircraft Corp.	1		1
United Mission to Nepal			1
United Technology Center	1		
Univac			1
Universal Machine Co.			1
U. S. Atomic Energy Comm.			1
U. S. Energy Corp.	1		
U. S. Forest Service			1
U. S. Gauge	1	1	1
U. S. Naval Research Lab.			1
U. S. Postal Dept.			1
U. S. Powder Co.			1
U. S. Radium Corp.			1
U. S. Steel	19	15	26
Valley Design			1
Value Engineering	1		
Van Heusen Co.			1
Vanity Fair Laminates	1		
Vertol	1		
Victory Engineering Corp.			1
Vipond & Vipond Inc.	1	1	1
Virginia Power & Electric	11	4	6
Vitro Laboratories			2
Voss Engineering			1
Wabso S & C Division			1

Wagner Electric Corp.			1
Waldron Hart Corp.	1		
Wald Industries Inc.	1		
Wards Hydronics	1		
Warren County Schools			1
Washington High School			1
Western Electric Co.	23	11	25
Westinghouse ARD			2
Westinghouse Computer	1	'	1
Westinghouse Electric Corp.	15	5	16
Westinghouse Elevator	1		
Weston Components	2	1	5
West Penn Power Co.	5	3	5
Westvaco	1	1	3
White Electromagnetics			1
Wickes Engineering	1		
William H. Major Assoc.			1
Willson Products	2	2	2
Wilkes-Barre Iron & Wire			1
Wilmot Engineering Co.			1
Wise Potato Chip			1
Witco Chemical Co.	1		
W. L. Maxon	1		
WPSX-TV			1
Woessner-McKnight Co.			1
W. T. Grant	1		
WRSC	1		

W. Vir. Pulp & Paper	1		
W. W. Snyder, Inc.	1		
Wyeth Laboratories	1	1	1
Xerox	33	16	25
York Shipley Inc.	1		
Youngstown Sheet & Tube			1
Zurn Industries	1		
Student	60		80
Armed Services	30		63

## APPENDIX II

76  
83

## GRADUATES RESIDING OUTSIDE PENNSYLVANIA\*

State	Rank Order	No. of Grads. Employed	%**	State	Rank Order	No. of Grads. Employed	%**
Alabama	26	1	.25	New Mexico	10	10	2.51
Arizona	19	2	.50	North Carolina	11	9	2.26
California	6	27	6.78	Ohio	4	34	8.54
Colorado	26	1	.25	Oklahoma	26	1	.25
Connecticut	8	12	3.01	Tennessee	19	2	.50
Delaware	7	14	3.51	Texas	17	4	1.00
Florida	14	6	1.50	Utah	26	1	.25
Georgia	19	2	.50	Vermont	26	1	.25
Illinois	9	10	2.51	Virginia	5	33	8.29
Indiana	16	5	1.25	Washington, D.C.	19	2	.50
Kentucky	26	1	.25	Washington	19	2	.50
Louisiana	19	2	.50	West Virginia	12	7	1.75
Maine	26	1	.25	Wisconsin	26	1	.25
Maryland	3	40	10.05	Foreign		2	.50
Massachusetts	18	3	.75	TOTAL****		398	99.63***
Michigan	12	7	1.75				
Minnesota	19	2	.50				
Missouri	14	6	1.50				
Nebraska	26	1	.25				
Nevada	26	1	.25				
New Hampshire	26	1	.25				
New Jersey	2	49	12.31				
New York	1	94	23.61				

\*398 of the 1177 graduates in this study had out-of-state residences (35 states, District of Columbia and Foreign).

\*\*This is the percentage of the graduates who have out-of-Pennsylvania addresses that live in that state ( $\frac{\text{number in that state}}{398} \times 100$ ).

398

\*\*\*Doesn't come out to 100% because of rounding.

\*35 states, District of Columbia, and Foreign.

## APPENDIX III

## GRADUATES\* RESIDING IN PENNSYLVANIA BY COUNTY\*\*

County	Rank Order	No. of Grads. Employed	%***	County	Rank Order	No. of Grads. Employed	%***
Adams	43	2	.25	Fayette	32	5	.64
Allegheny	1	82	10.52	Forest	47	1	.12
Armstrong	30	6	.77	Franklin	37	3	.38
Beaver	22	10	1.28	Greene	43	2	.25
Bedford	37	3	.38	Indiana	32	5	.64
Berks	3	49	6.29	Jefferson	37	3	.38
Blair	7	30	3.85	Juniata	47	1	.12
Bradford	37	3	.38	Lackawanna	4	42	5.39
Bucks	19	14	1.79	Lancaster	16	23	2.95
Butler	32	5	.64	Lawrence	43	2	.25
Cambria	22	10	1.28	Lebanon	27	7	.89
Cameron	47	1	.12	Lehigh	11	26	3.33
Carbon	21	11	1.41	Luzerne	2	61	7.83
Center	8	28	3.59	Lycoming	32	5	.64
Chester	36	4	.51	Mercer	25	9	1.15
Clarion	47	1	.12	Montgomery	5	34	4.36
Clearfield	20	13	1.66	Northampton	13	25	3.20
Clinton	47	1	.12	Northumberland	27	7	.89
Crawford	37	3	.38	Perry	47	1	.12
Cumberland	17	21	2.69	Philadelphia	15	24	3.08
Dauphin	11	26	3.33	Pike	47	1	.12
Delaware	18	16	2.05	Schuylkill	9	27	3.46
Elk	22	10	1.28	Somerset	47	1	.12
Erie	9	27	3.46	Susquehanna	25	9	1.15

County	Rank Order	No. of Grads. Employed	%***
Union	37	3	.38
Venango	30	6	.77
Warren	43	2	.25
Washington	27	7	.89
Wayne	47	1	.12
Westmoreland	13	25	3.20
Wyoming	47	1	.12
York	5	34	4.36
TOTAL		779	99.70%****

\*779 of the 1177 graduates in this study gave Pennsylvania addresses.

\*\*There were graduates residing in 56 counties in the Commonwealth.

\*\*\*This is the percentage of the graduates who live in Pennsylvania that live in that county ( $\frac{\text{number in that county} \times 100}{779}$ ).

\*\*\*\*Doesn't come out to 100% because of rounding.

APPENDIX IV  
THE COVER LETTER AND QUESTIONNAIRE

Dear Penn State Graduate:

The Pennsylvania State University is conducting a follow-up study of the Associate Degree graduates of the Commonwealth Campuses. This study has several major purposes:

1. To learn what has happened to you since you graduated.
2. To learn how you feel about the adequacy of the teaching you received in both the basic and specialized courses.
3. To determine the relationship between your Associate Degree program and your career.

Your responses, along with those of other Associate Degree graduates, will serve as a very important part of the evaluation of the Commonwealth Campus curriculums. This evaluation will serve as the basis for recommending changes that could lead to the improvement of the Associate Degree Programs for the benefit of future graduates. Therefore, it can be seen that your help is critically needed.

We have enclosed a short questionnaire for you to fill out. Would you be kind enough to take fifteen minutes or so and answer each question? Also, we request that you be completely honest and direct with your answers.

Upon completing the questionnaire, would you send it back to us in the enclosed pre-addressed envelope?

Thank you for your invaluable assistance. Best wishes.

Sincerely,

Angelo C. Gillie  
Director of the Study

## COMMONWEALTH CAMPUS STUDY

- A. Name \_\_\_\_\_
- B. Graduate from (circle the appropriate program): 1. DDT; 2. EET; 3. Other
- C. Circle the Commonwealth Campus where you received your Associate Degree:
- |                    |                    |                          |
|--------------------|--------------------|--------------------------|
| 1. Allentown       | 8. DuBois          | 15. Schuylkill           |
| 2. Altoona         | 9. Fayette         | 16. Shenango             |
| 3. Beaver          | 10. Hazleton       | 17. Wilkes-Barre         |
| 4. Behrend         | 11. McKeesport     | 18. Worthington-Scranton |
| 5. Berks           | 12. Mont Alto      | 19. York                 |
| 6. Capitol         | 13. New Kensington |                          |
| 7. Delaware County | 14. Ogontz         |                          |
- D. Year of graduation from Penn State Associate Degree Program 19\_\_\_\_
- E. Present Address \_\_\_\_\_
- | Street | Town | State | Zip |
|--------|------|-------|-----|
|--------|------|-------|-----|
- F. Marital Status: Single; Divorced; Separated; Widower  
No. of Dependents (Include Spouse) \_\_\_\_\_
- G. Military Experience (circle the appropriate item): 1. Yes 2. No 3. Overseas  
4. Domestic \_\_\_\_\_time served (mos.)

## YOUR WORK

Information about your first job after earning the Associate Degree:

- H. Employer's (Company) Name \_\_\_\_\_
- I. First Job Salary \$\_\_\_\_\_ per month (before taxes and other deductions)
- J. How many miles was your first job from where you lived when you graduated from high school? \_\_\_\_\_miles

Information About Your Present Job:

- K. Employer's (Company) Name \_\_\_\_\_
- L. Present Job Salary \$\_\_\_\_\_ per month (before taxes and other deductions)
- M. How many miles is your present job from where you lived when you graduated from high school? \_\_\_\_\_miles
- N. How many times since you received your Associate Degree have you made a job change and a residence change at the same time? \_\_\_\_\_times
- O. How many jobs with different companies have you held since receiving your Associate Degree? \_\_\_\_\_jobs



Circle those items in each list that described some of the things that you do in your job:

- | A               | B                     | C                        |
|-----------------|-----------------------|--------------------------|
| 1. Copying      | 1. Supervising        | 1. Precision Working     |
| 2. Synthesizing | 2. Serving            | 2. Tending               |
| 3. Comparing    | 3. Mentoring          | 3. Driving-Operating     |
| 4. Compiling    | 4. Instructing        | 4. Setting-Up            |
| 5. Coordinating | 5. Persuading         | 5. Handling              |
| 6. Computing    | 6. Negotiating        | 6. Operating-Controlling |
| 7. Analyzing    | 7. Speaking-Signaling | 7. Manipulating          |

P. Rank order general groups A, B, and C above in accordance with their importance to your present job.

\_\_\_\_\_ most important      \_\_\_\_\_ less important      \_\_\_\_\_ least important

Q. Circle the highest degree earned to date:

1. associate      2. bachelors      3. masters      4. doctorate

#### YOUR COURSE WORK AT PENN STATE

Following are several items relating to some of the basic courses you took in your Associate Degree Program at The Pennsylvania State University. For each item, "X" the appropriate spaces that best indicates your opinion of the quality of teaching in that subject. The degree to which you used it immediately after graduation, the degree to which you use it now, and its importance in the job you hope to get in the future. Please check one in each column.

SUBJECT	QUALITY OF INSTRUCTION				NEED FOR IT AFTER GRADUATION				YOUR NEED FOR IT NOW				NEED FOR IT TO GET DESIRED JOB IN THE FUTURE			
	Excellent	Good	Fair	Poor	Very Much	Much	Some	None	Very Much	Much	Some	None	Very Much	Much	Some	None
Freshman Mathematics	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Freshman Science	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
English	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Social Sciences	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

## III DDT GRADUATES ONLY

This is the final section of the survey and you are asked to give three responses for each of the items below. These topics deal with some of the major topics in the specialized portion of your Associate Degree Program. You are requested to evaluate them in terms of a) quality of instruction, b) the extent to which you used them immediately after graduation, and c) the extent to which you use them at the present time.

TOPIC	QUALITY OF INSTRUCTION					EXTENT USED WHEN FIRST GRADUATED				EXTENT USED NOW			
	Excel- lent	Good	Fair	Poor	Not Taught	Very Much	Much	Some	None	Very Much	Much	Some	None
AA Freehand sketching	1	2	3	4	5	1	2	3	4	1	2	3	4
AB Multiview layout	1	2	3	4	5	1	2	3	4	1	2	3	4
AC Graphical solutions	1	2	3	4	5	1	2	3	4	1	2	3	4
AD Kinematics	1	2	3	4	5	1	2	3	4	1	2	3	4
AE Strength of materials	1	2	3	4	5	1	2	3	4	1	2	3	4
AF Static load analysis	1	2	3	4	5	1	2	3	4	1	2	3	4
AG Dynamic load analysis	1	2	3	4	5	1	2	3	4	1	2	3	4
AH Analysis of structures	1	2	3	4	5	1	2	3	4	1	2	3	4
AI Manufacturing process	1	2	3	4	5	1	2	3	4	1	2	3	4
AJ Product design	1	2	3	4	5	1	2	3	4	1	2	3	4
AK Report writing	1	2	3	4	5	1	2	3	4	1	2	3	4
AL Computer programming	1	2	3	4	5	1	2	3	4	1	2	3	4

### III EET GRADUATES ONLY

This is the final section of the survey and you are asked to give three responses for each of the items below. These topics deal with some of the major topics in the specialized portion of your Associate Degree Program. You are requested to evaluate them in terms of a) quality of instruction, b) the extent to which you used them immediately after graduation, and c) the extent to which you use them at the present time.

TOPIC	QUALITY OF INSTRUCTION					EXTENT USED WHEN FIRST GRADUATED				EXTENT USED NOW			
	Excel- lent	Good	Fair	Poor	Not Taught	Very Much	Much	Some	None	Very Much	Much	Some	None
BA Vacuum tube theory	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BB Transistor circuit theory	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BC Integrated circuits	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BD Use of Electronic test equipment	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BE Pulse circuits	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BF Logic circuits	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BG Communications circuits	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BH Industrial Electronics circuits	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BI Microwave theory	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BJ Trouble-shooting analysis	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BK Binary Arithmetic	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__
BL Boolean Algebra	1__	2__	3__	4__	5__	1__	2__	3__	4__	1__	2__	3__	4__

## APPENDIX V

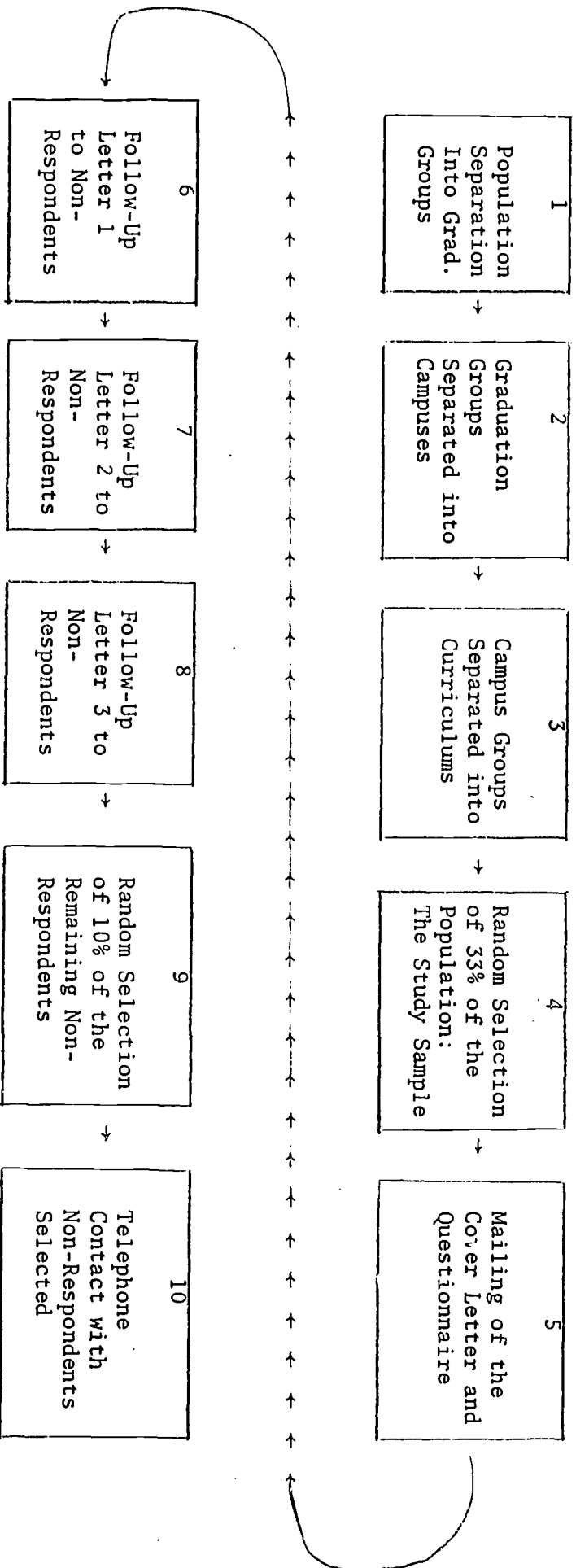
84

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## SAMPLE DISTRIBUTION

		Original Sample Number	# of bad Addresses	Original Number	respondents % of orig. Sample	Follow-up Sample Number	Follow-up Number	respondents % of follow-up Sample
1955	DDT	28	7	14	50			
	EET	40	9	15	38	2	2	100
1956	DDT	39	7	18	46	1	1	100
	EET	29	4	15	52	1	1	100
1957	DDT	65	12	33	51	2	2	100
	EET	46	6	21	46	1	1	100
1958	DDT	86	8	45	52	4	4	100
	EET	52	9	28	54	6	6	100
1959	DDT	79	10	44	56	5	5	100
	EET	62	8	28	45	2	2	100
1960	DDT	69	16	32	46	3	2	67
	EET	76	12	39	51	2	2	100
1961	DDT	57	10	25	44	3	3	100
	EET	49	7	21	43	2	2	100
1962	DDT	62	8	30	48	2	1	50
	EET	64	11	34	53	2	2	100
1963	DDT	95	10	48	51	7	6	86
	EET	79	12	28	35	6	4	67
1964	DDT	76	7	35	46	3	2	67
	EET	63	8	30	48	5	4	80
1965	DDT	94	7	53	56	2	2	100
	EET	78	11	40	51	1	1	100
1966	DDT	86	7	44	51	5	4	80
	EET	78	8	46	59	4	4	100
1967	DDT	75	7	44	58	4	3	75
	EET	87	3	46	52	1	1	100
1968	DDT	95	1	60	63	6	4	67
	EET	101	5	54	54	7	6	86
1969	DDT	94	1	68	72	4	4	100
	EET	94	-	67	71	4	3	75
Total	DDT	1,100	118	593	54	51	43	84
	EET	998	113	512	51	46	41	89
TOTAL		2,098	231	1,105	53	97	84	87

APPENDIX VI  
Sampling Strategy  
Flow Diagram



APPENDIX VII: EMPLOYER AND EMPLOYEE VARIABLES,  
RATIOS AND FACTORS

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EMPLOYER	First Jobbers A	Only Jobbers B	Present Jobbers C	TFTE	EEJMR	ELJP	EFJP	RF	1st Job Exit E	Later Jobbers D
Bell Telephone	78	50	63	91	1.44	1.26	1.17	2.79	28	13
IBM	59	38	48	69	1.44	1.26	1.17	2.81	21	10
Eastman Kodak	35	9	12	38	3.17	1.33	1.09	1.35	26	3
Xerox	33	16	25	42	1.68	1.56	1.27	1.94	17	9
Pa.Dept.of Highways	30	29	34	35	1.03	1.17	1.17	30.00	1	5
General Electric	27	12	27	42	1.56	2.25	1.56	1.80	15	15
Western Electric	23	11	25	37	1.48	2.27	1.61	1.92	12	14
McDonnell-Douglas	23	6	9	26	2.89	1.50	1.13	1.35	17	3
DuPont	32	14	19	37	1.95	1.36	1.16	1.78	18	5
Sandia	20	10	11	21	1.91	1.10	1.05	2.00	10	1
U. S. Steel	19	15	26	30	1.15	1.73	1.58	4.75	4	11
Newport News Shipbldg.	19	15	15	19	1.27	1.00	1.00	4.75	4	0
Pa. Power and Light	17	16	33	24	1.04	1.44	1.41	17.00	1	17
Boeing	16	6	7	17	2.43	1.16	1.06	1.60	10	1
Babcock & Wilcox	16	11	11	16	1.45	1.00	1.00	3.20	5	0
Westinghouse	15	5	16	26	1.63	3.20	1.73	1.50	10	11
Koppers, Inc.	13	8	8	13	1.63	1.00	1.00	2.60	5	0
Rocketdyne	13	0	0	13	--	--	1.00	1.00	13	0
Virginia Power	11	4	6	13	2.17	1.50	1.18	1.57	7	2
Elliot Co.	12	1	4	15	3.75	4.00	1.25	1.09	11	3
Ingersoll	11	5	7	13	1.86	1.40	1.18	1.83	6	2
New Jersey Zinc	11	3	3	11	3.67	1.00	1.00	1.38	8	0
RCA	11	6	13	18	1.39	2.17	1.64	2.20	5	7
PSU	10	9	11	12	1.09	1.22	1.20	10.00	1	2
NA Rockwell	9	7	9	11	1.22	1.29	1.22	4.50	2	2
Metropolitan Edison	8	8	11	11	1.00	1.38	1.38	--	0	3
Amp, Inc.	5	3	11	13	1.18	3.67	2.60	2.50	2	8